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One System: Tank Waste Disposition Integrated Flowsheet - River Protection Project Reference Integrated Flowsheet

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Key Words: One System, Tank Waste Disposition Integrated Flowsheet, TWDIF, River Protection Project, Direct Feed, DF LAW, DF HLW

Abstract: This document presents the River Protection Project (RPP) reference integrated flowsheet for the Tank Waste Disposition Integrated Flowsheet (TWDIF) activity. The RPP reference integrated flowsheet combines the ORP-11242, River Protection Project System Plan Baseline Case and the strategic framework for a phased mission approach presented by the DOE in September 2013 in the Hanford Tank Waste Retrieval, Treatment, and Disposition Framework. This document includes a block flow diagram of the major facilities and processes anticipated for the RPP Mission, a material flow, identification of interface flow parameters that affect material flow between facilities, and recommendations for future work.

RPP-RPT-57991, Rev. 0
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One System: Tank Waste Disposition Integrated Flowsheet – River Protection Project Reference Integrated Flowsheet

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EXECUTIVE SUMMARY

As the Tank Farms and the Waste Treatment and Immobilization Plant (WTP) transition to an operational phase, process flowsheets need to be developed to support waste retrieval and immobilization operations. The Tank Waste Disposition Integrated Flowsheet (TWDIF) activity was initiated to define these flowsheets and identify the means by which they can be developed to support operations through identifying and closing gaps, mitigating risks, and realizing opportunities.

This River Protection Project (RPP) Reference Integrated Flowsheet combines the ORP-11242 *River Protection Project System Plan*, Baseline Case and the strategic framework for a phased mission approach presented by the *Hanford Tank Waste Retrieval, Treatment, and Disposition Framework* (DOE 2013). This document includes: a block flow diagram (BFD) of the major facilities and processes anticipated for the RPP Mission, output from the Hanford Tank Waste Operations Simulator (HTWOS) showing the major material flows between interfacing operations of RPP facilities for each of the major phases of the RPP Mission and interface flow parameters (IFPs)—those parameters that affect the material flow across an interface in both operational [e.g., waste acceptance criteria (WAC)] and planning (e.g., flowsheet model assumptions) contexts and their bases.

The RPP Reference Integrated Flowsheet is an operational flowsheet in that it focuses on the ability of each facility to accept the waste from the upstream process and to prepare that waste to be accepted downstream. It focuses on the mission's ability to process waste rather than the timeframe for waste processing.

This report serves to document the RPP Reference Integrated Flowsheet; therefore, the team responsible for the TWDIF will be integral to identifying potential flowsheet problems early, working with the project teams to determine the requirements for their systems, and then reviewing the project solutions to ensure they fully integrate with the upstream and downstream facilities and/or unit operations. The TWDIF team will maintain the reference flowsheet, updating it as required to incorporate changes in planned systems and facility operations.

The development of this RPP Reference Integrated Flowsheet has informed the development of the TWDIF gaps, risks, and opportunities management plan (GROMP) and an associated TWDIF technical roadmap to recommend technical pathways to close the gaps, mitigate risks and realize opportunities described in the GROMP. The TWDIF GROMP effort has identified many risks to the reference flowsheet presented in this report, indicating that further flowsheet development and potential mitigations may be warranted. Listed below are recommendations and items for consideration when updating and refining the TWDIF BFD, mass flows, and IFPs during the next FY and beyond.

Three recommendations for the RPP Reference Integrated Flowsheet are included in this document:

1. The TWDIF mass flow modeling should be updated at least annually. To the extent practical, the modeling updates should include any flowsheet revisions identified or approved by the TWDIF team, the most recent planning available, technical updates investigated as part of the TWDIF technical roadmap, and any improvements to the inputs. The update should also include expansion of the key analyte list to include organic constituents important to the WTP performance assessment. Other considerations for the update include identification of rate limiting factors (e.g., evaporator capacity), comparison of results to requirements identified in the IFPs (e.g., waste acceptance criteria), and inclusion of chemical compounds rather than just elemental constituents.

2. A method of identifying IFPs that potentially have a high impact on the flowsheet should be developed and, based on those IFPs with high impact, a detailed review of their technical bases should be conducted. IFPs may also require the addition of further details (e.g., requirements for specific analytical techniques to verify compliance)

3. IFPs for some support interfaces and systems were not addressed in this revision. The consolidation of IFPs for these interfaces is still needed.

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LIST OF TERMS

Abbreviations and Acronyms

BBI	Best Basis Inventory
BFD	block flow diagram
BOF	balance of facilities
CFF	cross-flow filtration
CH	contact-handled
CWC	Central Waste Complex
DF	direct feed
DFHLW	Direct Feed High-Level Waste
DFLAW	Direct Feed Low-Activity Waste
DOE	U.S. Department of Energy
DST	double-shell tank
Ecology	State of Washington, Department of Ecology
ETF	Effluent Treatment Facility
FY	Fiscal Year
GRO	gaps, risks, and opportunities
GROMP	Gaps, Risks, and Opportunities Management Plan
HEPA	high-efficiency particulate air
HLW	high-level waste
HSF	Hanford Shipping Facility
HTWOS	Hanford Tank Waste Operations Simulator
IDF	Integrated Disposal Facility
IFP	interface flow parameter
IHLW	immobilized high-level waste
IHS	Interim Hanford Storage
ILAW	immobilized low-activity waste
IMUST	inactive miscellaneous underground storage tank
IX	ion exchange
ISM	Integrated Solubility Model
LAW	low-activity waste
LAW PS	Low-Activity Waste Pretreatment System
LDR	land disposal requirements
LERF	Liquid Effluent Retention Facility
LLW	low-level waste
MUST	miscellaneous underground storage tank
ORP	Office of River Protection
PDSA	Preliminary Documented Safety Analysis
PT	Pretreatment
PUREX	Plutonium Uranium Extraction (Plant)
RL	DOE Richland Operations Office
RPP	River Protection Project
SALDS	State-Approved Land Disposal Site

SLAW	Supplemental Low-Activity Waste (Immobilization)
SRNL	Savannah River National Laboratory
SST	single-shell tank
TEDF	Treated Effluent Disposal Facility
TOC	Tank Operations Contractor
TOC	total organic carbon
TRU	transuranic
TWCS	Tank Waste Characterization and Staging
TWDIF	Tank Waste Disposition Integrated Flowsheet
WAC	waste acceptance criteria
WIPP	Waste Isolation Pilot Plant
WRF	Waste Retrieval Facility
WTP	Waste Treatment and Immobilization Plant

Units

Ci	curie
gal	gallon
gpm	gallon per minute
kg	kilogram
MTG	metric tons of glass
wt %	weight percent

1.0 INTRODUCTION

1.1 BACKGROUND

The mission of the U.S. Department of Energy (DOE) Office of River Protection's (ORP's) River Protection Project (RPP) is to remove waste generated from the production of nuclear materials from underground tank farms at the Hanford Site, treat the waste to standards that are protective of human health and the environment, and close the tanks and treatment facilities.

Hanford tanks contain a complex and diverse mix of radioactive and chemical waste in the form of sludge, salts, and liquids, necessitating a variety of unique waste retrieval, treatment, and disposition methods. The mission is expected to require decades to complete.

The RPP requires several facilities containing a number of process unit operations to complete its mission. Some facilities are already operating (e.g., the 242-A Evaporator), others are under construction [e.g., the Waste Treatment and Immobilization Plant (WTP)] while others are at a conceptual design stage (e.g., Supplemental Low-Activity Waste). Descriptions of the facilities as a whole exist (e.g., ORP-11242, *River Protection Project System Plan*) and the flows of material through them have been modeled (e.g., supporting data for ORP-11242).

As the Tank Farms and WTP transition to an operational phase, there is a need to develop integrated process flowsheets to support such operations. These flowsheets are multi-level in that they become progressively more detailed as the perspective moves from the RPP Mission to individual facility and then unit process operation levels.

The Tank Waste Disposition Integrated Flowsheet (TWDIF) activity was initiated to integrate these flowsheets and the means by which they can be developed to support operations through identifying and closing gaps, mitigating risks and realizing opportunities. Document RPP-PLAN-56634, *One System Plan for Developing and Managing the Tank Waste Disposition Integrated Flowsheet* defines three deliverables for Fiscal Year (FY) 2014:

- The TWDIF RPP Reference Integrated Flowsheet report shows all major facilities as groups of process unit operations required to complete the RPP's Mission to retrieve, treat, and dispose of Hanford's tank waste. It also tabulates the major material flows between interfacing process unit operations of RPP facilities. Interface flow parameters (IFPs) are those parameters that affect the material flow across an interface in both operational (e.g., waste acceptance criteria) and planning (e.g., flowsheet model assumptions) contexts. IFPs and their technical bases are included in this deliverable.

- The TWDIF Gaps, Risks and Opportunities Management Plan (GROMP) describes the gaps, risks, and opportunities (GROs) presented by the TWDIF RPP Reference Integrated Flowsheet, its material balance, and the IFPs' technical bases.

- The TWDIF Technical Roadmap recommends technical pathways to close the gaps, mitigate risks and realize opportunities described in the GROMP.

1.2 PURPOSE

The purpose of this report is to show all major facilities as groups of process unit operations required to complete the RPP Mission on a single BFD. In addition, the major material flows between interfacing process unit operations of RPP facilities are tabulated for the overall mission and for each of the major phases of the RPP Mission.

Interface flow parameters—those parameters that affect the material flow across an interface in both operational [e.g., waste acceptance criteria (WAC)] and planning (e.g., flowsheet model assumptions) contexts and their bases—are identified. TWIDF's management scope of authority and responsibility is limited to the interfaces between the process unit operations of RPP facilities and how material flows between them. Existing RPP facility design authorities retain responsibility over the flowsheets internal to those RPP facilities. However, evaluation of elements of the internal flowsheets is anticipated from a RPP Mission integration viewpoint when internal elements impact IFPs.

The RPP Reference Integrated Flowsheet is an operational flowsheet in that it focuses on the technical ability of each facility to accept the waste of the upstream process and to prepare that waste to be accepted downstream, rather than being a mission flowsheet with a focus on the mission's duration.

This report serves to document the RPP Reference Integrated Flowsheet. Therefore, the team responsible for the TWDIF activity will be integral to identifying potential flowsheet problems early, working with the project teams to determine the functional requirements of the systems, and then reviewing the project solutions to ensure they fully integrate with the upstream and downstream facilities and/or unit operations. The TWDIF team will maintain the reference flowsheet changes, updating it as required to incorporate changes in planned systems and facility operations.

1.3 OBJECTIVE

The objective of this document is to provide the Reference Integrated Flowsheet for the RPP Mission (including a BFD, mass flows, and IFPs) in sufficient detail and completeness to enable identification of GROs and completion of the TWDIF GROMP.

1.4 SCOPE

This document presents the Reference Integrated Flowsheet for the RPP Mission that combines the ORP-11242, *River Protection Project System Plan* Baseline Case and the strategic framework for a phased mission approach presented by the DOE in September 2013 in the *Hanford Tank Waste Retrieval, Treatment, and Disposition Framework*. This document includes a BFD of the major facilities and processes anticipated for the RPP Mission (Section 2.0), a material flow (Section 3.0), identification of IFPs between facilities (Section 4.0), and recommendations for future work (Section 5.0).

The RPP Reference Integrated Flowsheet scope starts with the waste in Tank Farms and encompasses the process steps required to retrieve and immobilize the tank farm waste for final disposal. This scope does not encompass processing steps for processes associated with shipping or final disposal of immobilized waste, nor does it include tank farm or waste management area closure.

2.0 BLOCK FLOW DIAGRAM

2.1 THE RIVER PROTECTION PROJECT MISSION

The RPP is required to address the risks posed by the 56 million gallons radioactive and chemical wastes currently stored in underground single-shell tanks (SSTs) and double-shell tanks (DSTs) at the Hanford Site as safely and expeditiously as possible. The current strategy for completing the RPP Mission involves transferring waste stored in the SSTs to the newer DSTs, immobilizing the waste, and ultimately closing the tanks and decommissioning the treatment facilities.

The majority of the immobilization will occur in the WTP. The WTP is a highly complex nuclear and chemical processing facility with many first-of-a-kind technology applications. The tank waste at Hanford is also the most complex radioactive tank waste in the United States. The complexity of both the waste itself as well as the WTP facilities has led to difficult, and to date, unresolved technical issues for portions of the facilities [the Pretreatment (PT) Facility]. The WTP design first processes all the waste through the PT Facility, prior to low-activity waste (LAW) or HLW vitrification; therefore, immobilization of any waste cannot occur per the current design until the technical issues involving the PT Facility are resolved. For that reason, an alternative approach for immobilizing waste as soon as practicable has been identified and is presented in *Hanford Tank Waste Retrieval Treatment, and Disposition Framework*. In addition, a portion of the HLW contains fast-settling particles, including plutonium dioxide or plutonium metal particles, which are expected to challenge PT operations.

Contact-handled transuranic waste (CH-TRU) is located in 11 SSTs and is planned to be processed in the Supplemental TRU Treatment Facility and then transferred to the Waste Isolation Pilot Plant (WIPP) for disposal.

Options for treating HLW that does not meet the WAC for the PT Facility include directly feeding wastes that meet the broader WAC for the HLW Facility to the HLW Facility (bypassing the PT Facility) or preconditioning the waste prior to treatment in PT Facility.

For near-term risk reduction and to leverage the experience gained as the WTP facilities are completed, DOE is considering a phased approach to the tank waste mission with the first phases bypassing the WTP PT Facility while the unresolved technical issues with that facility are resolved. DOE is considering a strategy to direct feed (DF) LAW to the WTP LAW Facility during the time period that WTP PT is not operational. This strategy would require a new facility to remove solids and cesium from the supernate contained in the DST system prior to vitrification. In addition, DOE is considering a similar near term DFHLW solution to start HLW vitrification. To allow DFHLW to proceed, a Tank Waste Characterization and Staging (TWCS) functionality will be needed. The TWDIF activity will confirm the need for these facilities and/or recommend other unit operations necessary to support the RPP Mission.

The RPP facilities are further described in Section 2.3.

For the purposes of the TWDIF activity, ORP has broken the RPP Mission into five distinct phases with five different flowsheet configurations. The phases for the TWDIF activity are:

- Phase 1 – Near-term operations, which run from now to the start of DFLAW operations.
- Phase 2 – DFLAW, which runs from the startup of DFLAW operations to the start of DFHLW operations.
- Phase 3 – DFHLW, which runs from the startup of DFHLW to the start of WTP PT.
- Phase 4 – WTP Full Operations which runs from the startup of WTP PT to the startup of Supplemental Low-Activity Waste (SLAW) Immobilization.
- Phase 5 – Balance of Mission, which runs from the startup of SLAW Immobilization to the end of the mission.

The mission phases are discussed in further detail in Section 2.3.

A BFD showing all major facilities as groups of process unit operations required to complete the RPP Mission with DFLAW and DFHLW phases is presented in Figure 2-1. The interface numbers in Figure 2-1 identify the interfaces between facilities and a list of these interfaces is provided in Table 2-1. Interfaces that have mass flow in both directions have “a” and “b” designations after the number for the two different flows. For each interface, IFPs have been identified. The IFPs are discussed further in Section 4.0 and are presented in Appendix B.

Figure 2-1. Summary Block Flow Diagram.

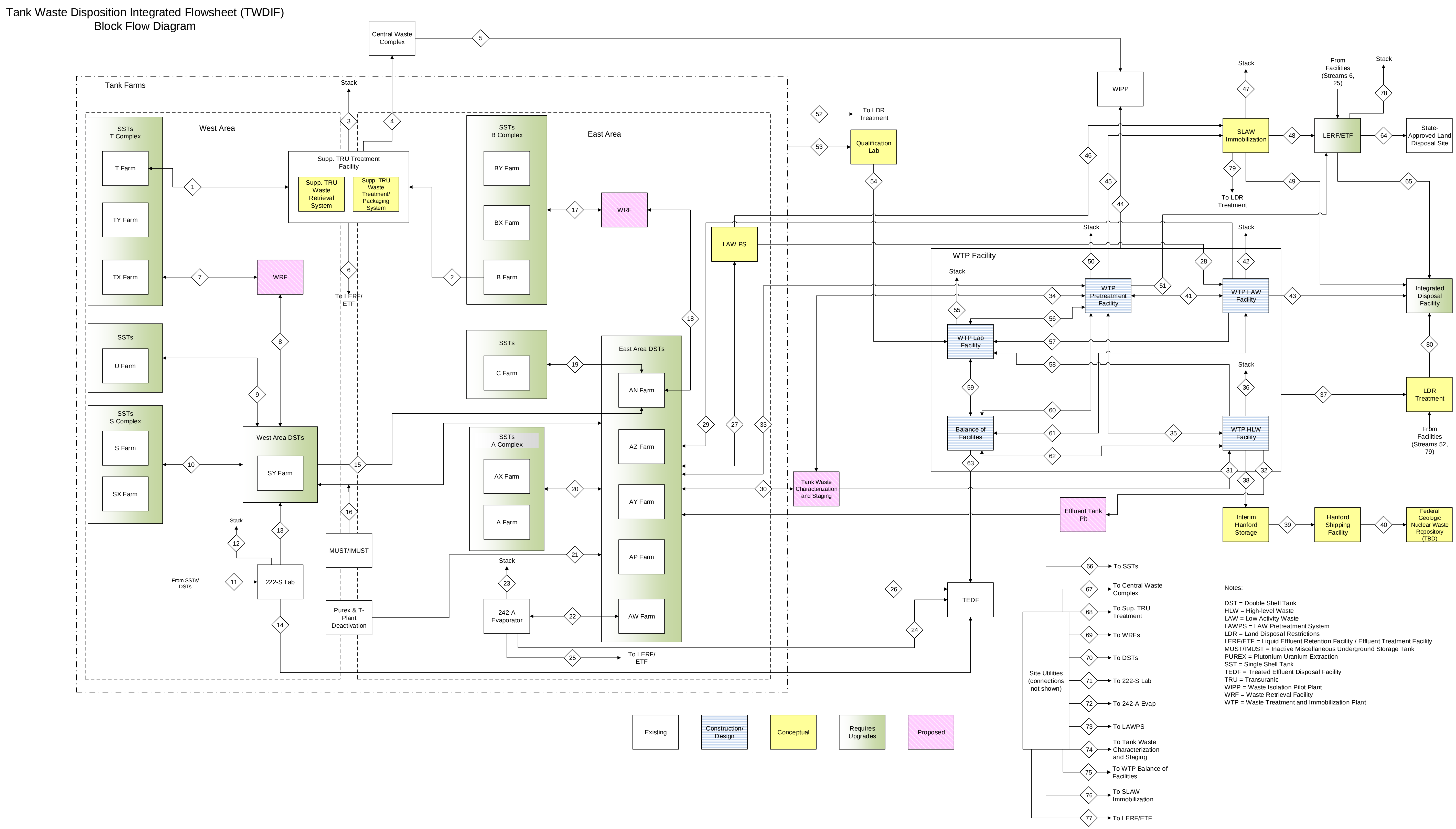


Table 2-1. Block Flow Diagram Interface Identification.

Interface[1]	From	To	Primary Flow
1a[2]	T Complex SSTs	Supp. TRU Treatment Facility	CH-TRU
1b[2]	Supp. TRU Treatment Facility	T Complex SSTs	Supernate for Sluicing
2	B Complex SSTs	Supp. TRU Treatment Facility	CH-TRU
3	Supp. TRU Treatment Facility	Stack	Off-gas
4	Supp. TRU Treatment Facility	Central Waste Complex	Immobilized CH-TRU Waste
5	Central Waste Complex	WIPP	Immobilized CH-TRU Waste
6	Supp. TRU Treatment Facility	LERF/ETF	Secondary Liquid Waste
7a[2]	T Complex SSTs	T Complex WRF	Waste
7b[2]	T Complex WRF	T Complex SSTs	Supernate for Sluicing
8a[2]	T Complex WRF	West Area DSTs	Waste
8b[2]	West Area DSTs	T Complex WRF	Supernate for Sluicing
9a[2]	U Farm SSTs	West Area DSTs	Waste
9b[2]	West Area DSTs	U Farm SSTs	Supernate for Sluicing
10a[2]	S Complex SSTs	West Area DSTs	Waste
10b[2]	West Area DSTs	S Complex SSTs	Supernate for Sluicing

Table 2-1. Block Flow Diagram Interface Identification.

Interface[1]	From	To	Primary Flow
11[3]	SSTs and DSTs	222-S Lab	Waste Samples
12[3]	222-S Lab	Stack	Off-gas
13	222-S Lab	West Area DSTs	Waste
14[3]	222-S Lab	TEDF	Wastewater
15	West Area DSTs	East Area DSTs	Waste
16	MUST/IMUST	DSTs	Waste
17a[2]	B Complex SSTs	B Complex WRF	Waste
17b[2]	B Complex WRF	B Complex SSTs	Supernate for Sluicing
18a[2]	B Complex WRF	East Area DSTs	Waste
18b[2]	East Area DSTs	B Complex WRF	Supernate for Sluicing
19a[2]	C Farm SSTs	East Area DSTs	Waste
19b[2]	East Area DSTs	C Farm SSTs	Supernate for Sluicing
20a[2]	A Complex SSTs	East Area DSTs	Waste
20b[2]	East Area DSTs	A Complex SSTs	Supernate for Sluicing
21	Purex & T-Plant	East Area DSTs	Waste

Table 2-1. Block Flow Diagram Interface Identification.

Interface[1]	From	To	Primary Flow
22a	AW Farm	242-A Evaporator	Dilute Waste
22b	242-A Evaporator	AW Farm	Concentrated Waste
23	242-A Evaporator	Stack	Off-gas
24[3]	242-A Evaporator	TEDF	Wastewater
25	242-A Evaporator	LERF/ETF	Secondary Liquid Waste
26[3]	East Area DSTs	TEDF	Ventilation Effluent
27a	East Area DSTs	LAW PS	Supernate Waste
27b	LAW PS	East Area DSTs	Solids and Cs Return
28	LAW PS	WTP LAW Facility	LAW
29	WTP LAW Facility	East Area DSTs	Secondary Liquid Waste
30a	East Area DSTs	TWCS	Slurry Waste
30b[3]	TWCS	East Area DSTs	Off Spec Waste
31	TWCS	WTP HLW Facility	HLW
32	WTP HLW Facility	East Area DSTs	Secondary Liquid Waste
33a	East Area DSTs	WTP Pretreatment Facility	Supernate Waste

Table 2-1. Block Flow Diagram Interface Identification.

Interface[1]	From	To	Primary Flow
33b[3]	WTP Pretreatment Facility	East Area DSTs	Off Spec Waste
34a	TWCS	WTP Pretreatment Facility	Slurry Waste
34b	WTP Pretreatment Facility	TWCS	Off Spec Waste
35a	WTP Pretreatment Facility	WTP HLW Facility	HLW
35b	WTP HLW Facility	WTP Pretreatment Facility	Secondary Liquid Waste
36	WTP HLW Facility	Stack	Off-gas
37	WTP Facility	LDR Treatment	Secondary Solid Waste
38	WTP HLW Facility	Interim Hanford Storage	Immobilized HLW
39	Interim Hanford Storage	Hanford Shipping Facility	Immobilized HLW
40	Hanford Shipping Facility	Federal Geologic Nuclear Waste Repository	Immobilized HLW
41a	WTP Pretreatment Facility	WTP LAW Facility	LAW
41b	WTP LAW Facility	WTP Pretreatment Facility	Secondary Liquid Waste
42	WTP LAW Facility	Stack	Off-gas
43	WTP LAW Facility	Integrated Disposal Facility	Immobilized LAW
44[3]	WTP Pretreatment Facility	WIPP	Waste

Table 2-1. Block Flow Diagram Interface Identification.

Interface[1]	From	To	Primary Flow
45	WTP Pretreatment Facility	SLAW Immobilization	LAW
46	LAW PS	SLAW Immobilization	LAW
47	SLAW Immobilization	Stack	Off-gas
48	SLAW Immobilization	LERF/ETF	Secondary Liquid Waste
49	SLAW Immobilization	Integrated Disposal Facility	Immobilized LAW
50	WTP Pretreatment Facility	Stack	Off-gas
51	WTP Pretreatment Facility	LERF/ETF	Secondary Liquid Waste
52[3]	Tank Farms	LDR Treatment	Secondary Solid Waste
53[3]	Tank Farms	Outside Lab	Waste Samples
54[3]	Outside Lab	WTP Lab Facility	Waste Samples
55[3]	WTP Lab Facility	Stack	Off-gas
56a[3]	WTP Pretreatment Facility	WTP Lab Facility	Waste Samples
56b[3]	WTP Lab Facility	WTP Pretreatment Facility	Secondary Liquid Waste
57[3]	WTP LAW Facility	WTP Lab Facility	Waste Samples
58[3]	WTP HLW Facility	WTP Lab Facility	Waste Samples

Table 2-1. Block Flow Diagram Interface Identification.

Interface[1]	From	To	Primary Flow
59a[3]	WTP Balance of Facilities	WTP Lab Facility	Utilities
59b[3]	WTP Lab Facility	WTP Balance of Facilities	Wastewater
60a	WTP Balance of Facilities	WTP Pretreatment Facility	Utilities
60b	WTP Pretreatment Facility	WTP Balance of Facilities	Wastewater
61a	WTP Balance of Facilities	WTP LAW Facility	Utilities
61b[3]	WTP LAW Facility	WTP Balance of Facilities	Wastewater
62a	WTP Balance of Facilities	WTP HLW Facility	Utilities
62b[3]	WTP HLW Facility	WTP Balance of Facilities	Wastewater
63[3]	WTP Balance of Facilities	TEDF	Wastewater
64	LERF/ETF	State-Approved Land Disposal Site	Wastewater
65	LERF/ETF	Integrated Disposal Facility	Secondary Solid Waste
66	Site Utilities	SSTs	Utilities
67[3]	Site Utilities	Central Waste Complex	Utilities
68[3]	Site Utilities	Supp. TRU Treatment Facility	Utilities
69	Site Utilities	WRFs	Utilities

Table 2-1. Block Flow Diagram Interface Identification.

Interface[1]	From	To	Primary Flow
70	Site Utilities	DSTs	Utilities
71[3]	Site Utilities	222-S Lab	Utilities
72	Site Utilities	242-A Evaporator	Utilities
73	Site Utilities	LAW PS	Utilities
74	Site Utilities	TWCS	Utilities
75[3]	Site Utilities	WTP Balance of Facilities	Utilities
76	Site Utilities	SLAW Immobilization	Utilities
77[3]	Site Utilities	LERF/ETF	Utilities
78[3]	LERF/ETF	Stack	Off-gas
79	SLAW Immobilization	LDR Treatment	Secondary Solid Waste
80[3]	LDR Treatment	Integrated Disposal Facility	Secondary Solid Waste

[1]Interfaces that have mass flow in both directions have “a” and “b” designations after the number for the two different flows.

[2]The Hanford Tank Waste Operations Simulator (HTWOS) does not track mass flow for these individual a and b interfaces but reports a net mass flow for the interface.

[3]Mass flows for these interfaces are not tracked by HTWOS.

2.2 MISSION FACILITIES

2.2.1 Tank Farms

2.2.1.1 Single-Shell Tanks

The SST system is currently operational. There are 149 SSTs on the Hanford Site constructed between 1943 and 1964; 66 SSTs are located in 200 East Area, and 83 SSTs are located in 200 West Area. The East Area SST farms encompass BY, BX, and B Farms in the B Complex; C Farm; and AX and A Farms in the A Complex. The West Area SST farms encompass T, TY, and TX Farms in the T Complex; U Farm; and the S and SX Farms in the S Complex. The SSTs are used only for waste storage and have had nearly all free liquid removed. SST waste inventories today are primarily solidified sludges and crystallized salts with only incidental amounts of liquid.

Waste retrieval from SSTs requires a variety of techniques among tanks with different waste characteristics, design attributes, and operating histories. Multiple technologies may need to be deployed within a single tank to meet waste retrieval requirements. Each SST waste retrieval process results in the transfer of waste from the SST to a receiver tank, which is typically a DST or a tank within a waste retrieval facility (WRF). The retrieved waste is mobilized using either supernate from the DST system or water and the resultant retrieval waste stream is transferred as slurry consisting primarily of dissolved salt or suspended solids.

CH TRU waste currently stored in seven T Farm tanks and four B Farm tanks will be retrieved and sent directly to supplemental TRU treatment facilities located at those farms.

2.2.1.2 Double-Shell Tanks

The DST system is currently operational. There are 28 DSTs on the Hanford Site; three in 200 West Area, and 25 in 200 East Area. SY Farm is the only DST farm in the West Area. The East Area DST farms are AN, AZ, AY, AP and AW. All were constructed between 1968 and 1986. The DSTs contain liquids and settled solids, either salts or sludge. The DSTs play an integral role within the RPP Mission including:

- Supporting SST waste retrieval by receiving the retrieved SST waste
- Receiving waste from facilities such as 222-S Laboratory; miscellaneous underground storage tanks (MUSTs) and inactive miscellaneous underground storage tanks (IMUSTs); and Plutonium Uranium Extraction (PUREX) Plant and T Plant deactivation
- Supporting 242-A Evaporator operations
- Supporting cross site waste transfers
- Preparing waste for and feeding waste to processing facilities such as the LAW Pretreatment System (LAW PS), TWCS, and the WTP PT Facility

- Receiving secondary liquid wastes associated with DFLAW and DFHLW from LAW PS and the WTP LAW and HLW Facilities.

Effective and efficient management of the storage space available in the DSTs is essential to the success of the RPP Mission.

2.2.1.3 Inactive/Miscellaneous Underground Storage Tanks

ORP is responsible for dozens of ancillary underground storage tanks known as MUSTs and IMUSTs. Some of these tanks are operational while some are currently inactive. These smaller, auxiliary tanks supported historical Tank Farm operations.

The number of IMUSTs under ORP management may change as the status of waste sites and operable units is better understood and as agreements between ORP and DOE Richland Operations Office (RL) are adjusted. The TWDIF assumed that ORP was responsible for 60 MUSTs (43 IMUSTs and 17 MUSTs).

2.2.1.4 Plutonium Uranium Extraction (PUREX) Plant and T-Plant Deactivation

PUREX and T Plant are existing decommissioned facilities which will require final cleanout prior to permanent disposition. Wastes from the cleanout of the PUREX Plant and T Plant are projected to be sent to the DST system. The TWDIF assumes that the DSTs will not receive wastes from the cleanout of other facilities.

2.2.1.5 Waste Retrieval Facilities

The WRFs are proposed facilities which are planned to be available for use to support SST retrievals. The Tank Operations Contractor (TOC) baseline currently includes the design, construction, and operation of two WRFs: one in the 200 East Area near B Complex, and one in the 200 West Area near T Complex. These two waste complexes are geographically distant (several miles) from the nearest DST farms. As such, they require additional facilities to support timely and efficient SST waste retrievals. Each WRF is assumed to provide:

- Six 150,000 gal waste receipt tanks with pumps, transfer lines to the SSTs, and other ancillary equipment to allow recycle of supernate during waste retrieval, thereby minimizing the volume of waste generated by retrieval operations. The tanks would also provide space for the temporary storage of the retrieved waste, to decouple SST retrievals from the near-term limits of DST storage space.

- Waste transfer lines from the WRF to the DSTs and the pumping capacity needed to transfer the retrieved waste slurries at high solids loadings over the considerable distance to the nearest DST storage tanks, without exceeding the allowable pressure ratings for transfer system components.

2.2.1.6 Supplemental Transuranic Treatment Facility

The Supplemental TRU Treatment Facility is in early design and has been placed in “standby.” Twenty tanks (17 SSTs and three DSTs) have been evaluated by the TOC as containing waste that DOE could designate as TRU waste based on analytical reports that identified the origins of the waste in those tanks. Of those 20 tanks, 11 SSTs contain contact-handled waste and nine contain remote-handled waste.

The TWDIF assumes that 11 SSTs will be handled as CH TRU tank waste, and that waste will be treated at a supplemental TRU treatment facility, then stored onsite at the Central Waste Complex (CWC) until shipment to WIPP. The remote-handled waste is planned to be immobilized in the WTP along with HLW.

The CH-TRU tank waste treatment and packaging process will use a modular approach. The facility will be first located at B Farm, the tank farm supplying the initial TRU tank waste feed, and then be relocated to T Farm, which supplies the remaining TRU tank waste feed. A single modular system, designed for relocation, has the advantage of cost-effectively maintaining a pristine TRU product, thus maintaining its TRU designation and meeting WIPP WAC.

The CH-TRU tank waste treatment system uses a high-vacuum, low-temperature, rotary dryer to remove water from the retrieved sludge. The dried product, consisting of approximately 10 wt% water, 10 wt% sand, and 80 wt% waste solids is packaged in 55 gal drums. The low-dosage TRU waste product allows manual operation of the drum-filling equipment and movement of product drums without requiring remote manipulators. Condensate from the dryer is filtered and then discharged to the Liquid Effluent Retention Facility (LERF) / Effluent Treatment Facility (ETF) via a tank truck or reused to retrieve and transport additional TRU sludge. Off-gas is high efficiency particulate air (HEPA) filtered and then discharged to the atmosphere.

2.2.1.7 222-S Laboratory

The 222-S Laboratory is currently operational and is a full-service analytical facility located in 200 West Area that handles highly radioactive samples. Organic, inorganic, and radio-chemical analyses are performed on a wide variety of air, liquid, soil, tank waste, and biota samples. The laboratory provides support for a variety of essential tank farm activities, including tank to-tank transfers, corrosion rate studies, and chemical testing to support tank corrosion inhibition, and input to the engineering specifications for each 242-A Evaporator campaign. The 222-S Laboratory also studies the physical and chemical characteristics of waste necessary to enable waste retrievals, provides data to support tank closure requirements, and supports the vadose zone program. In addition, 222-S Laboratory maintains the ability to analyze low-level and non-radioactive samples in support of developmental and industrial hygiene activities. A small business contractor (Advanced Technologies and Laboratories, Inc.) provides a service for routine analytical support at the laboratory. In the future, the 222-S Laboratory may provide support to WTP operations.

2.2.1.8 242-A Evaporator

The 242-A Evaporator is currently operational. The primary mission of the 242-A Evaporator is to support tank farm waste storage by reducing dilute waste volume. Evaporator availability is essential to the success of the RPP Mission to continue SST waste retrievals and to adjust the sodium levels to meet WTP feed requirements. In addition, the evaporator will be used to volume reduce the secondary liquid wastes returned to Tank Farms during DFLAW and DFHLW. The evaporator operates on a campaign basis, using the time between campaigns to implement facility upgrades as necessary.

2.2.1.9 Low-Activity Waste Pretreatment System (LAW PS)

LAW PS is currently in the conceptual design phase. For the DFLAW flowsheet, the waste from the DSTs will be treated in LAW PS. Treatment will consist of filtration with cross-flow filtration (CFF) and removal of the cesium using elutable ion exchange (IX). The CFF system separates entrained solids from the supernate and returns them to the DSTs, and the IX removes cesium from the supernate. The treated waste is then fed directly to the WTP LAW Vitrification Facility, bypassing the WTP PT Facility. Secondary liquid waste from the IX elution (cesium product) and filtration flushes will be routed back to the Tank Farms.

LAW PS may also be used to provide supplemental LAW pretreatment capacity if required to keep SLAW Immobilization fully fed after WTP PT is brought online.

2.2.2 Waste Treatment and Immobilization Plant

The WTP is currently being designed and built by Bechtel National, Inc. There are five main facilities within the WTP Project: the PT Facility, HLW Vitrification Facility, LAW Vitrification Facility, dedicated Analytical Laboratory, and the Balance of Facilities (BOF), which includes supporting infrastructure systems such as air, water, electrical, power, fire protection, and others.

The WTP will generate secondary solid and liquid waste streams. The secondary solid waste (e.g., spent LAW melters, spent ion-exchange resin, HEPA filters, carbon absorbers) is assumed to be disposed of in the Integrated Disposal Facility (IDF). A disposal path for spent HLW melters has not yet been identified. The secondary liquid waste produced during full operations is treated at the ETF while secondary liquid wastes produced during direct feed operations are returned to Tank Farms.

2.2.2.1 Pretreatment Facility

Pretreatment engineering, procurement, and construction are currently on hold pending the resolution of technical issues. The WTP PT Facility will receive both HLW feed and LAW feed from the Tank Farms. Specific pretreatment processes include concentration, ultrafiltration using cross-flow filters, cesium removal by IX, caustic and oxidative leaching of waste solids, and subsequent separation of the waste into two streams: a HLW fraction for treatment at the HLW Vitrification Facility, and a LAW fraction for treatment at the LAW Vitrification Facility.

The PT Facility also receives secondary liquid waste from the WTP LAW and HLW vitrification offgas treatment systems; prior to the startup of the PT Facility, these wastes are sent from the LAW and HLW Facilities to the Tank Farms.

2.2.2.2 Low-Activity Waste Vitrification Facility

The WTP LAW Vitrification Facility is currently under construction. This facility will immobilize approximately 40 percent of the LAW fraction of the waste in glass, which is poured into LAW stainless-steel packages. Each LAW package will hold 5.51 metric tons of glass (MTG) on average. The filled immobilized LAW (ILAW) containers are assumed to be transferred to the onsite IDF for disposal.

2.2.2.3 High-Level Waste Vitrification Facility

The HLW procurement and construction are currently on hold pending completion of design changes and alignment of the safety basis with the design through the Preliminary Documented Safety Analysis (PDSA). The WTP HLW Vitrification Facility will immobilize the HLW fraction of the waste in glass, which is poured into HLW stainless-steel canisters. Each HLW canister will hold 3.02 MTG on average. The filled immobilized high-level waste (IHLW) canisters will be transferred to interim Hanford storage (IHS), and then transported to an off-site geologic repository for disposal.

2.2.2.4 WTP Analytical Laboratory

The WTP Analytical Laboratory is currently under construction. The WTP Analytical Laboratory will provide operational support to the PT, HLW, and LAW facilities such as waste analysis to determine glass former additions.

2.2.2.5 Balance of Facilities

The BOF is under construction. The WTP includes 20 support facilities, including the Glass Former Facility and collectively referred to as the BOF. These support facilities provide various utilities and other functions to support the PT, HLW, and LAW facilities.

2.2.3 Other Facilities

2.2.3.1 Tank Waste Characterization and Staging

TWCS is a proposed new facility that would provide improved tank waste slurry mixing, sampling and characterization, and staging of waste before it is fed to the WTP.

TWCS would be used to condition waste for the DFHLW flowsheet. For DFHLW, the TWDIF assumes that the HLW sludge is washed in the DSTs. The slurry is then transferred to TWCS where the sludge is certified to meet the DFHLW WAC. The TWCS then sends the slurry directly to the HLW Vitrification Facility, bypassing the WTP PT Facility.

Once WTP PT is brought online, the TWDIF assumes TWCS will stage and certify waste batches before they are sent to WTP PT for processing. TWCS may also perform other processing functions (e.g., waste particle segregation and size reduction) as required to meet PT waste acceptance criteria.

2.2.3.2 Effluent Tank Pit

The effluent tank pit is a proposed system associated with DFLAW and DFHLW, which would collect HLW secondary liquid wastes and add chemicals as needed to meet DST corrosion control requirements before transferring them back to the Tank Farms.

2.2.3.3 Supplemental Low-Activity Waste Immobilization Facility

The SLAW Immobilization Facility is a future facility. The WTP, as currently scoped, was not intended to process all of the LAW tank waste. The DOE has pursued a variety of strategies to obtain additional needed LAW treatment capacity. For the purpose of the TWDIF, SLAW Immobilization is assumed to be a second LAW vitrification facility.

2.2.3.4 Liquid Effluent Retention Facility (LERF) / Effluent Treatment Facility (ETF), and State-Approved Land Disposal Site (SALDS)

The LERF, ETF, and SALDS are all currently operational. The LERF is designed to store process condensate and dilute contaminated liquid waste streams for treatment at the ETF. The LERF consists of three basins, each equipped with primary and secondary liners, leachate detection, collection and removal systems, and a floating cover. Transfer piping and pumps connect the LERF to the 242-A Evaporator, ETF, and WTP.

The ETF provides for the collection and treatment of low-level mixed wastes and the disposal of the treated wastes (via the SALDS) meeting applicable state and federal permit requirements. The ETF has the capacity to treat 24 Mgal of waste per year. Secondary wastes from ETF (e.g., evaporator bottoms) are solidified for disposal.

In 2007, the State of Washington, Department of Ecology (Ecology) approved the construction of a new solidification treatment unit for ETF that would treat and solidify concentrate from the existing ETF evaporator by mixing the concentrate with dry, cementitious raw materials (e.g., Portland cement, fly ash, blast furnace slag, and/or lime). Solidified concentrate would be disposed of at IDF. This upgrade to ETF has not yet been installed.

In addition to the waste streams already being collected, treated, and disposed at LERF/ETF, liquid effluent secondary wastes generated during WTP operations will be sent to ETF for further treatment and disposal, either as liquids at the SALDS or as a solidified waste form at IDF.

Treated effluent from the ETF is transferred via pipeline to the SALDS where it is discharged to the ground.

2.2.3.5 Treated Effluent Disposal Facility (TEDF)

The TEDF collects, conveys, and disposes of treated effluent from the 200 East and 200 West Areas. The system first became operational in 1995. Typical sources that contribute to this effluent are the following:

- Ventilation, heating, and cooling systems for buildings
- Rainwater from parking lots and exterior paved areas
- Potable water
- Boiler blowdown
- Cooling water blowdown
- Floor and sink drains with limited and strictly controlled usage

The major components of the TEDF include pipeline connecting three pumping stations, one disposal sample station, and two disposal ponds.

2.2.3.6 Integrated Disposal Facility (IDF)

The construction on the IDF is complete; however the facility is not yet operational. The IDF will provide on-site disposal of:

- ILAW from WTP
- Mixed waste generated through waste operations
- Other low level waste (LLW), including LLW from WTP, Tank Farms, and SLAW Immobilization
- Spent or failed LAW melters from the WTP
- ILAW
- Solidified ETF wastes.

The facility consists of a single landfill with two separate, expandable cells that would be used if and when the additional capacity is needed. One cell (Cell 1) may receive dangerous and/or hazardous waste, specifically mixed LLW. This waste includes the ILAW from WTP and SLAW Immobilization, the spent or failed melters, and ETF waste. The other cell (Cell 2) will not receive dangerous and/or hazardous waste; it will receive only LLW. Both cells include a double-liner system, leachate collection and removal systems, and a leak-detection system.

2.2.3.7 Land Disposal Requirement (LDR) Treatment

The exact nature of LDR treatment is not yet defined, however the TWDIF assumes that LDR treatment will consist of an offsite facility or potentially several facilities, which will treat and immobilize secondary solid waste from the LAW and HLW Vitrification Facilities prior to returning the waste to the IDF for disposal.

2.2.3.8 Central Waste Complex (CWC)

The CWC is operational. The CWC in the 200 West Area provides compliant interim storage for containerized LLW and mixed LLW pending on-site disposal, and solid TRU waste awaiting treatment and pending determination of final disposition.

The CWC receives, stores, and distributes solid radioactive and non-radioactive waste in a safe and environmentally compliant manner. The CWC consists of an outdoor area, which is used to store large waste boxes, and multiple storage structures that provide interim storage for solid waste awaiting appropriate treatment and final disposal. The solid waste is received from both on-site and off-site generators. LLW, mixed LLW, and mixed TRU waste are all stored at the CWC.

2.2.3.9 Waste Isolation Pilot Plant (WIPP)

The WIPP is the nation's only permanent disposal site for TRU waste created during the research and production of nuclear weapons. The WIPP site is located 26 miles east of Carlsbad, New Mexico, where TRU waste is entombed in a 2,000 foot thick layer of natural salt 2,150 feet below the surface.

2.2.3.10 Interim Hanford Storage

The IHS is a future facility that will receive and temporarily store canisters of IHLW, with the IHLW canisters subsequently retrieved and transported to the Hanford Shipping Facility (HSF) in preparation for shipment to a national repository. Initially, IHS will provide storage for 4,000 canisters. Additional modules, each with a 2,000 canister capacity, can be built as needed until reaching a maximum capacity of 16,000 canisters. IHS would be located in 200 East Area.

2.2.3.11 Hanford Shipping Facility (HSF)

The HSF is a future facility. As the HSF is currently envisioned, the facility would receive, package, and stage the IHLW canisters from ORP, and the spent nuclear fuel multi-canister overpacks and spent fuel standard canisters from RL. The canisters and overpacks would be loaded into casks, and the loaded casks would be transported offsite to a national repository for permanent disposal. The HSF would have a 40 year design life. The facility would be specified to match the receiving capabilities of IHS. The HSF would be located in 200 East Area, and built either as a standalone facility or as a module attached to the IHS.

2.2.3.12 Federal Geological Repository

The Federal Geological Repository has yet to be identified. The repository is planned to be an off-site geologic repository designed to isolate the IHLW from the environment for tens or hundreds of thousands of years.

2.2.3.13 Qualification Laboratory

A decision on a qualification laboratory has not yet been made. The qualification laboratory will qualify waste from the Tank Farms to meet the WTP WACs prior to delivery to WTP, LAW PS, and TWCS. There are several laboratories, both on and offsite, which are being considered to fill this role. Until such a time as the qualification laboratory has been selected, the RPP Reference Integrated Flowsheet shows a qualification laboratory as a place holder.

2.2.3.14 Site Utilities

Site utilities are existing systems provided by Mission Support Alliance, LLC (MSA). They include raw water, potable water, and electricity. While chemical additions to the SSTs and DSTs to support retrievals and DST corrosion controls are not technically "site utilities," they have been captured under the heading of site utilities for the purposes of tracking the mass flow in the flowsheet.

2.3 MISSION PHASES

Pending the resolution of technical issues, engineering, procurement, and construction on the WTP PT Facility are currently on hold; and pending the completion of design changes and alignment of the safety basis with the design through the PDSA, procurement and construction on the WTP HLW Facility are currently on hold. In order to begin immobilizing Hanford waste as soon as practicable, DOE has provided a framework that relies on a phased startup of the WTP facilities (see *Hanford Tank Waste Retrieval Treatment, and Disposition Framework*). The flowsheets associated with each phase of this approach have been individually assessed as part of the TWDIF effort. The following mission phases have been analyzed in the RPP Reference Integrated Flowsheet:

- Phase 1 – Near-Term Operations, which run from now until the startup of DFLAW operations
- Phase 2 – DFLAW, which runs from the startup of DFLAW operations to the startup of DFHLW operations
- Phase 3 – DFHLW, which runs from the startup of DFHLW operations to the startup of WTP PT
- Phase 4 – WTP Full Operations, which runs from the startup of WTP PT to the startup of SLAW Immobilization
- Phase 5 – Balance of Mission, which runs from the startup of SLAW Immobilization to the end of the mission.

Each of these phases will be discussed in additional detail in the following sections.

2.3.1 Phase 1 – Near-Term Operations

Phase 1, Near-Term Operations, as defined for the TWDIF activity runs from now until DFLAW operations begin. The key activities performed in Phase 1 include:

- Retrievals in C-Farm
- A and AX Farm Retrievals
- Operation of the Supplemental TRU Treatment Facility with B Farm CH-TRU waste
- Operation of LAW PS to prepare for DFLAW hot commissioning.

The Phase 1 BFD is shown in Figure 2-2. Facilities which will be operational are shown as solid blocks, while facilities that are not utilized during this phase are shadowed. Only operational interfaces between facilities are shown.

2.3.2 Phase 2 – Direct Feed Low-Activity Waste

Phase 2, DFLAW, as defined for the TWDIF activity runs from the startup of DFLAW operations until DFHLW operations begin. The key activities in Phase 2 include:

- Operation of the Supplemental TRU Treatment Facility with T Farm CH-TRU waste.
- Operation of the LAW PS to supply DFLAW to the WTP LAW Facility
- DFLAW operations, which include the use of the WTP LAW Facility, the WTP Lab Facility, and BOF
- Receipt and handling of DFLAW secondary liquid wastes in Tank Farms
- Receipt of ILAW in IDF
- Operation of TWCS to prepare for DFHLW hot commissioning
- Continued SST Retrievals
- Continued operation of the Supplemental TRU Treatment Facility
- Operation of the qualification laboratory.

The Phase 2 BFD is shown in Figure 2-3.

2.3.3 Phase 3 – Direct Feed High-Level Waste

Phase 3, DFHLW, as defined for the TWDIF activity runs from the startup of DFHLW operations until WTP PT operations begin. The key activities performed in Phase 3 include:

- Continued operation of LAW PS to supply feed to the WTP LAW Facility
- Continued operation of DFLAW
- Continued receipt of ILAW at IDF

- Operation of TWCS to supply feed to the WTP HLW Facility
- Receipt and handling of DFLAW and DFHLW secondary liquid wastes in Tank Farms
- Receipt of IHLW at IHS and, when possible, shipment of that IHLW to the Federal Geological Nuclear Waste Repository.
- Continued SST Retrievals
- Continued operation of the Supplemental TRU Treatment Facility
- Continued operation of the qualification laboratory.

The Phase 3 BFD is shown in Figure 2-4.

2.3.4 Phase 4 – Waste Treatment and Immobilization Plant Full Operations

Phase 4, WTP Full Operations, as defined for the TWDIF activity runs from the startup of WTP PT operations until SLAW Immobilization operations begin. The key activities performed in Phase 4 include:

- Switching from DFLAW and DFHLW operations to full WTP vitrification operations utilizing the WTP PT Facility
- Continued operation of LAW and HLW Vitrification Facilities
- Continued receipt of ILAW at IDF
- Continued receipt of IHLW at IHS
- Operation of TWCS to supply slurry to the WTP PT Facility
- Receipt of WTP secondary liquid wastes at LERF/ETF
- Continued SST retrievals
- Potential MUST/IMUST retrievals.

The Phase 4 BFD is shown in Figure 2-5.

2.3.5 Phase 5 – Balance of Mission

Phase 5, Balance of Mission, as defined for the TWDIF activity runs from the startup of SLAW Immobilization through the end of the mission. The key activities performed in Phase 5 include:

- Continued operation of LAW and HLW Vitrification Facilities
- Continued receipt of ILAW at IDF
- Continued receipt of IHLW at IHS
- Continued operation of TWCS to supply slurry to the WTP PT Facility
- Operation of SLAW Immobilization for LAW

- The supply of LAW to SLAW Immobilization from WTP PT
- Operation of LAW PS to supply SLAW Immobilization with LAW feed as needed
- Operation of the WRFs to support B and T Complex retrievals
- Continued SST retrievals
- Cleanout of PUREX and T-Plant.

The Phase 5 BFD is shown in Figure 2-6.

Figure 2-2. Phase 1 Block Flow Diagram.

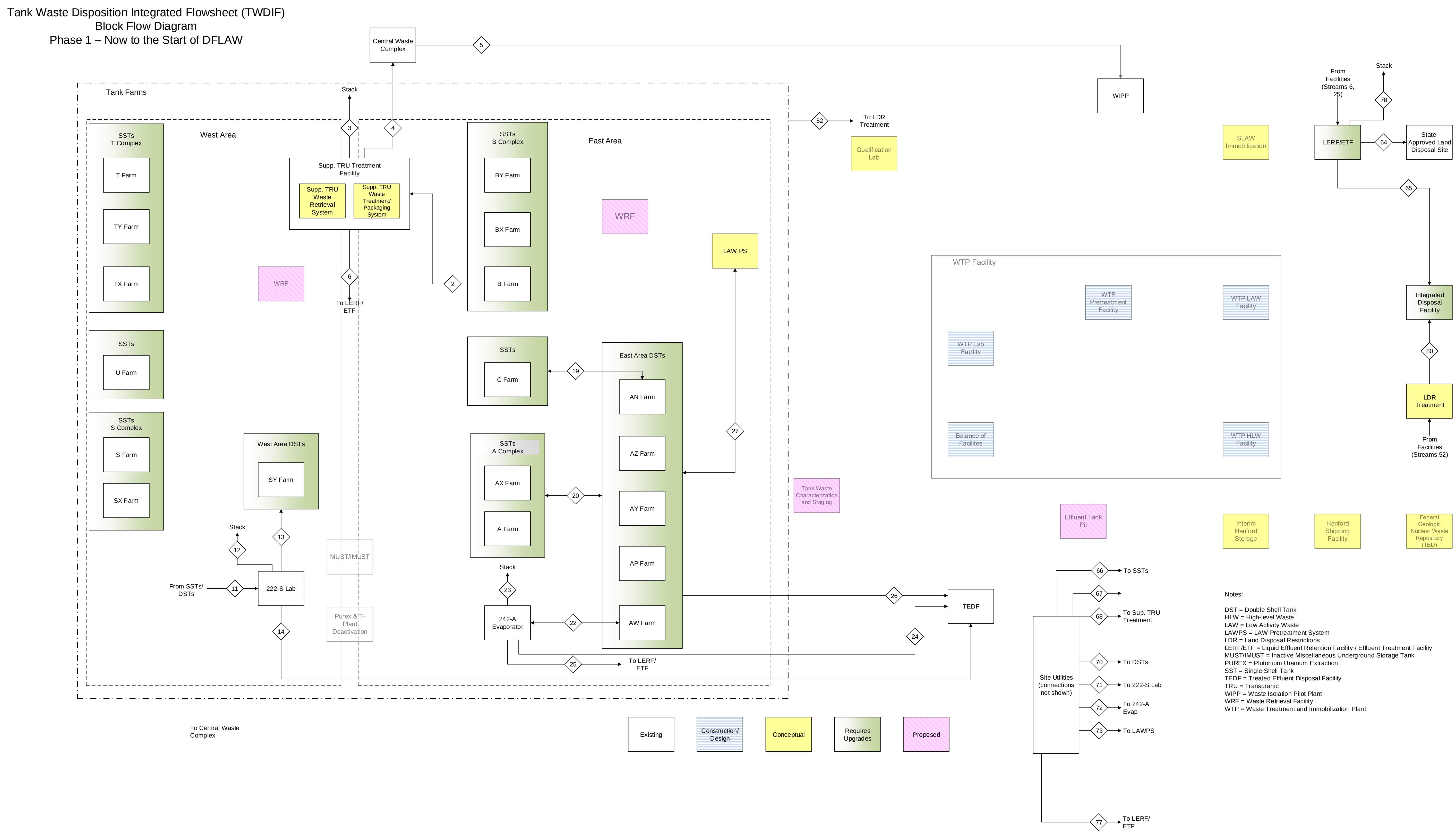


Figure 2-3. Phase 2 Block Flow Diagram.

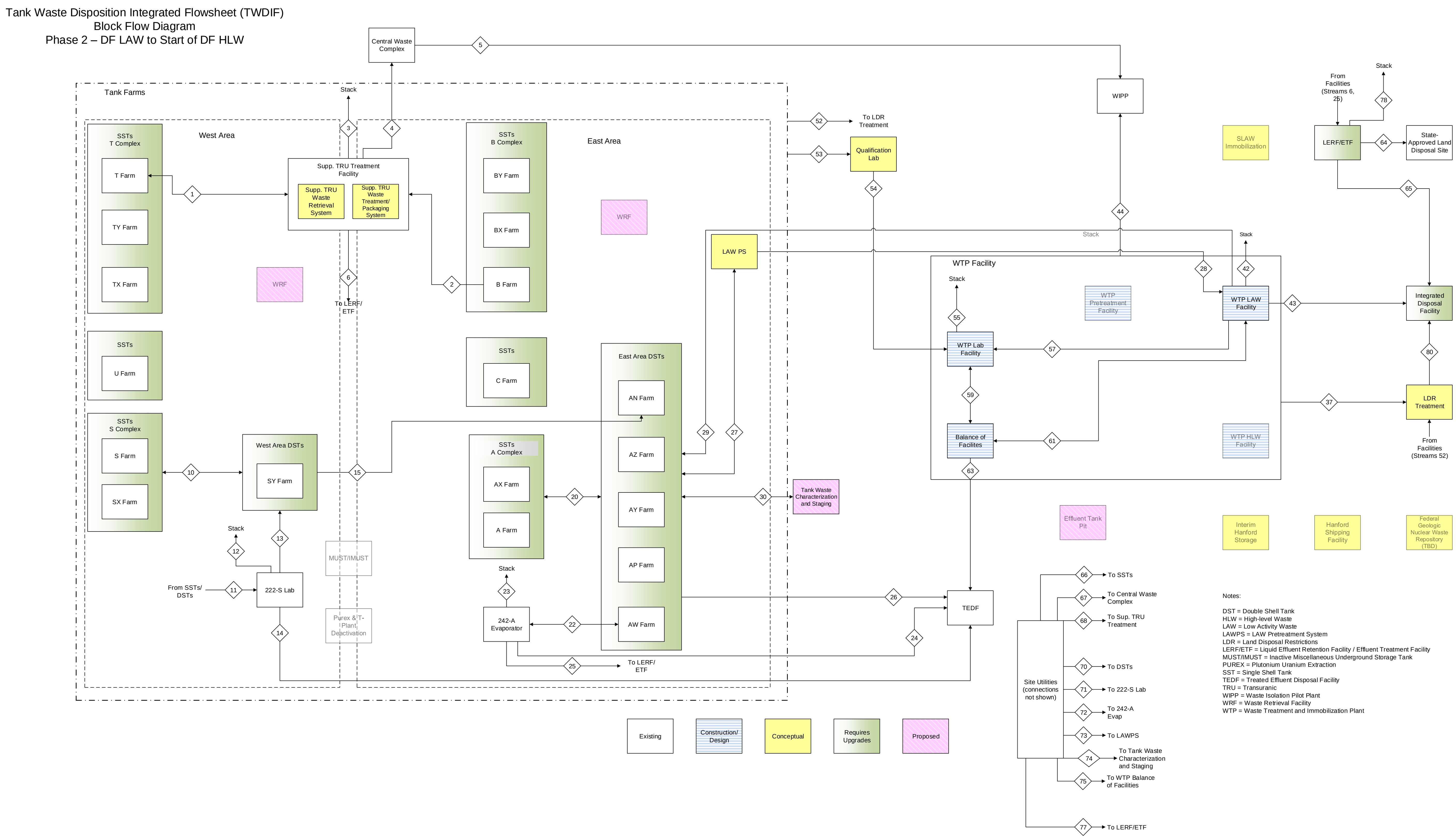


Figure 2-4. Phase 3 Block Flow Diagram.

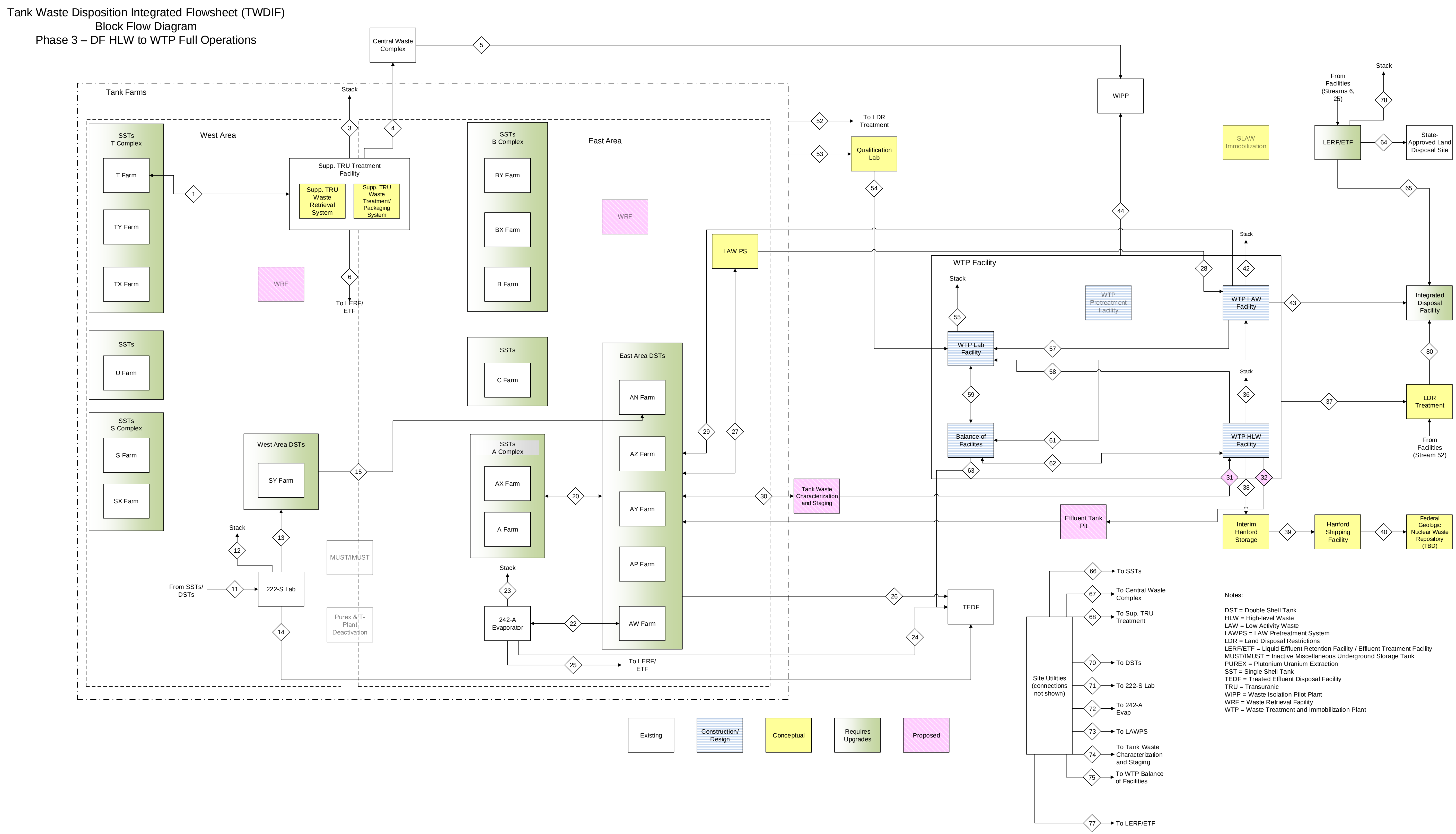


Figure 2-5. Phase 4 Block Flow Diagram.

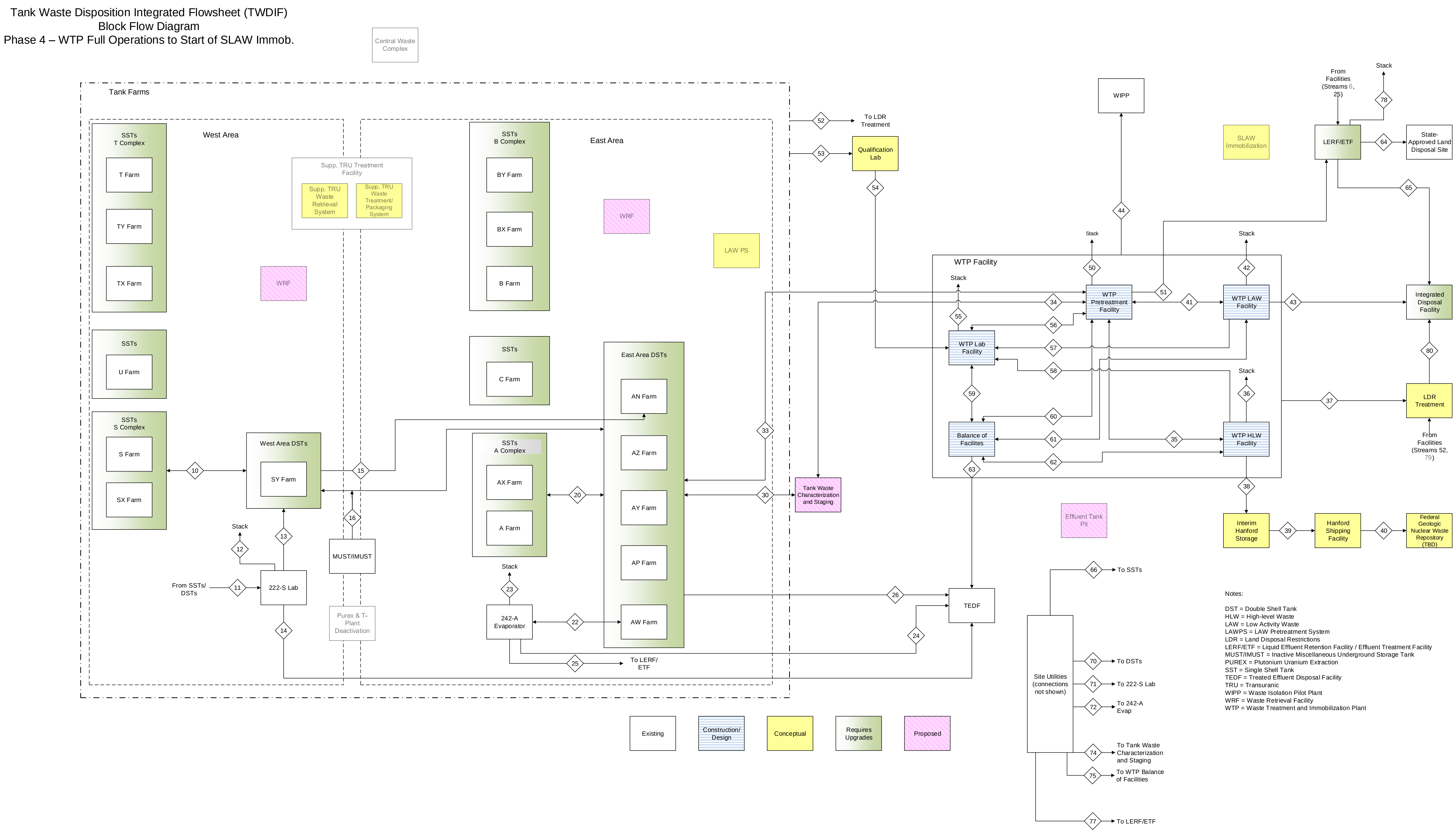
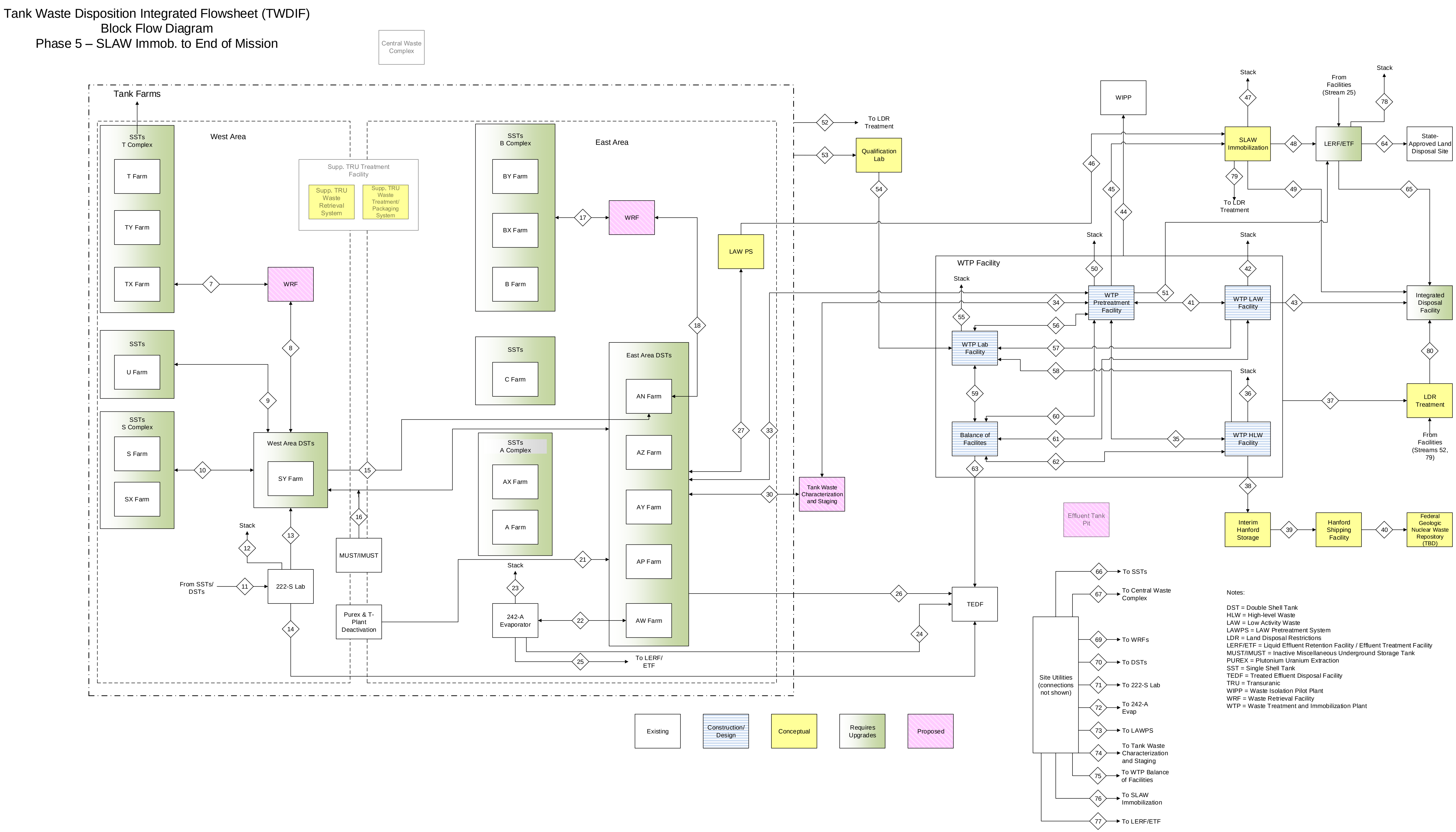


Figure 2-6. Phase 5 Block Flow Diagram.



3.0 MASS FLOW MODELING

The RPP Reference Integrated Flowsheet includes a tabulation of the flow of major tank waste constituents between interfacing process unit operations of RPP facilities. The Hanford Tank Waste Operations Simulator (HTWOS) model is a dynamic, event simulation model, governed by prescribed initial conditions, constraints, and operating logic that is used to simulate the full duration of the RPP Mission. The HTWOS is one of a number of planning tools used to support system planning efforts; a description of these planning tools is provided in TFC-PLN-143, "River Protection Project System Integration Management Plan."

This initial revision of the RPP Reference Integrated Flowsheet is based on an HTWOS model run using current technical bases for input parameters and an initial waste inventory from the Best Basis Inventory (BBI).

3.1 APPROACH

Mass flows were obtained from a run using HTWOS version 7.7. HTWOS was configured to include the facilities and the phased operating approach described in Section 2. HTWOS was operated utilizing the Integrated Solubility Model (ISM), which is a dynamic tool for calculating the solid/liquid equilibrium of the waste throughout the HTWOS model. Data capture points were added to the TWDIF HTWOS run in order to capture the mass flows across each of the interfaces identified in Figure 2-1 and Table 2-1. Data was written out from the model for each of the TWDIF phases. Data manipulation consisted predominantly of arranging the information in a more user friendly format and is presented in SVF-2931, *SVF-2931-02 TWDIF Flowsheet Calculations*.

3.2 USE OF COMPUTER SOFTWARE

The mass flow data was produced using the HTWOS version 7.7. HTWOS is registered under HISI ID number 638. Specifics of the modeling case are documented in MMR-14-024, *TWDIF Flowsheet Modeling*.

The mass flow data was formatted (SVF-2931) using Microsoft Office® Excel®[1] 2010. No add-in software was used in the spreadsheet.

3.3 CURRENT INVENTORY WASTE BASIS

The BBI is the source of current tank waste inventories used by HTWOS. The BBI is not listed as an assumption, but as an input to HTWOS and establishes the initial waste inventory. No uncertainty is applied to the values in the BBI during the HTWOS evaluations. HTWOS version

[1] Microsoft Office® and Excel® are registered trademarks of Microsoft Corporation, Redmond, Washington.

7.7 starting tank inventories represent the contents of the tanks as of October 1, 2013 (documented in RPP-33715, *Double-Shell and Single-Shell Tank Inventory Input to the Hanford Tank Waste Operations Simulator Model – 2014 Update*). The inventory is based on BBI data downloaded from the Tank Waste Inventory Network System. The 2014 inventory data set represents the composition of the waste in the Hanford tanks with an effective date of January 6, 2014 and was input into HTWOS under MMR-13-059, *Input FY2012 Tank Inventory into HTWOS*. The inventory was also adjusted to account for historical transfers, planned SST retrieval operations, near-term transfers, and near-term evaporator campaigns.

The discussion in Appendix A provides a status on the current understanding of the tank waste compositional basis and physical properties such as particle size, particle density, and rheology, specifically related to their use in the HTWOS-based RPP Reference Integrated Flowsheet while acknowledging their potential application in future flowsheet models.

3.4 CONFIGURATION AND ASSUMPTIONS

The TWDIF team was directed by ORP to configure the flowsheet in a similar configuration to the options presented in *Hanford Tank Waste Retrieval Treatment, and Disposition Framework*. An explanation of the configuration and assumptions associated with the TWDIF activity and the RPP Reference Integrated Flowsheet are presented in Table 3-1.

Table 3-1. Configuration and Assumptions.

Title	Flowsheet Configuration and Assumptions
DFLAW	• Begin LAW Facility operations before the PT Facility is operational • LAW PS provides DFLAW feed to the LAW Facility. LAW PS is located between Tank Farms and the LAW Facility and removes solids and cesium from supernate currently stored in the DST system. LAW PS provides DFLAW at a sodium concentration between 5 and 6 molar, which is below the 7.5 molar sodium the LAW Facility is expected to run during full operations. • All secondary liquid wastes associated with DFLAW are returned to Tank Farms. A portion of the waste will be volume reduced using the 242-A Evaporator. The secondary liquid wastes chemistry is adjusted to meet the current DST corrosion specifications prior to being returned to Tank Farms. • After the first batch of DFLAW processed through LAW PS, the supernate sodium content is adjusted for processing through LAW PS using secondary liquid waste returns whenever practical. This avoids additional evaporative load on the 242-A Evaporator.

Table 3-1. Configuration and Assumptions.

Title	Flowsheet Configuration and Assumptions
	• TWDIF assumes that IDF will be available once the LAW Facility is operational. • TWDIF assumes that the WTP Analytical Laboratory Facility and Balance of Facilities will be available to support DFLAW operations. • TWDIF assumes that the LAW Facility receives feed from LAW PS for about 5 ½ years before it begins to receive feed from the WTP PT Facility.
DFHLW	• Begin HLW Facility operations before the PT Facility is operational • HLW washing is performed in Tank Farms. Washing is limited to two wash cycles and targets a 15 wt% feed to TWCS. • TWCS provides DFHLW to the HLW Facility. TWCS is assumed to be a standalone facility containing six 500,000 gallon tanks. TWCS is assumed to have the ability to stage, sample, mix, and characterize waste for delivery to the HLW Facility. • All secondary liquid wastes associated with DFHLW are returned to Tank Farms to be volume reduced using the 242-A Evaporator. The secondary liquid wastes chemistry is adjusted to meet the current DST corrosion specifications in a new Effluent Tank Pit prior to being returned to Tank Farms. • TWDIF assumes that the IHS will be available once the HLW Facility is operational. • TWDIF assumes that the WTP Lab Facility and Balance of Facilities will be available to support DFHLW operations. • TWDIF assumes that the HLW Facility receives feed from TWCS for about 2 years before is begins to receive feed from the WTP PT Facility.
Supplemental TRU Treatment Facility	• TWDIF assumes that 11 tanks in B and T Farms will be legally classified as CH-TRU for disposal at WIPP. • Skid-mounted processing equipment will be used to process and package the waste retrieved from the CH-TRU tanks. The equipment will first be located at B Farm and then relocated to T Farm.
SLAW	• SLAW Immobilization is assumed to be a LAW

Table 3-1. Configuration and Assumptions.

Title	Flowsheet Configuration and Assumptions
Immobilization	vitrification facility with 6 melters. Secondary liquid wastes from the facility are assumed to be recycled back to the front end of the facility where they are mixed back into the incoming waste which is then conditioned using an evaporator. • SLAW Immobilization's primary LAW source is the WTP PT Facility with LAW PS providing supplemental LAW feed as needed to keep the facility at full capacity. • TWDIF assumes that SLAW Immobilization begins operations 2 years after WTP PT Facility begins sending feed to the LAW Facility.
TWCS Feed to PT Facility	• TWCS provides the ability to stage, sample, mix and characterize waste for delivery to the WTP PT Facility. • TWDIF assumes that TWCS includes solids segregation and size reduction capability.
Feed to 242-A Evaporator	TWDIF assumes that feed for the 242-A Evaporator is staged in a DST for 90 days before being sent to the evaporator. During this time, samples would be taken, processed, and analyzed and pre-run documentation would be completed to support the evaporator campaigns.

3.5 MASS FLOW RESULTS

Mass flow results are tabulated for each mission phase and for the entire mission. The results listed in this report are limited key analytes. Key analytes were determined to be components with a limit in the WTP data quality objectives, components which limit glass formulation, and oxalate, which was added to the list as an important analyte due to its impact on waste chemical stability, sludge washing and melter reduction/oxidation calculations. A full listing of components tracked by HTWOS can be found in SVF-2931.

HTWOS decays radionuclides on a yearly basis and the outputs provided for this mass flow were not back decayed to the same date, which means that under certain circumstances, there may be negative values for curies shown in the tables below and that the end of mission curie counts may not add up to the total curies listed in the BBI today as the values have decayed throughout the mission.

There are a few circumstances where the summary mass flow tables differ from the values in SVF-2931. In these cases, the values found in SVF-2931 were set to zero for the tables in this report as the interfaces in question were not used in a particular phase. All the values zeroed out were the result of modeling artifacts from the method used for data capture or rounding errors.

Table 3-2 summarizes information on the LAW glass packages, HLW canisters, and TRU waste drums generated for each phase.

Table 3-2. Summary of Mass Flow Results.

Metric	Phase 1 Near-Term	Phase 2 DFLAW	Phase 3 DFHLW	Phase 4 WTP Full Operations	Phase 5 Balance of Mission	RPP Mission Total
LAW glass mass (MTG)	0	19,220	7,713	14,908	639,119	680,960
LAW glass packages	0	3,489	1,400	2,707	116,027	123,623
HLW glass mass (MTG)	0	0	2,211	604	29,293	32,108
HLW glass canisters	0	0	732	200	9,701	10,633
Potential TRU waste drums	575	2,388	4,421	0	0	7,384
Sodium reporting to LAW glass (MT)	0	2,508	1,135	2,190	72,335	78,168
LAW glass sodium oxide loading	N/A	18%	20%	20%	15%	15%
HLW glass waste oxide loading	N/A	N/A	36%	36%	36%	36%

3.5.1 Phase 1 – Near-Term Operation

Table 3-3 provides a summary mass flow of major interfaces and constituents of interest for Phase 1. The information was taken from SVF-2931. The interface numbers match those depicted in Figure 2-1 and Figure 2-2. Interfaces whose mass flows are not tracked by HTWOS (see Table 2-1) are not included in Table 3-3.

Table 3-3. Phase 1 Summary Mass Flow.

Interface Number	1a	2	3	4	5	6	7a	8a	9a	10a	13	15	16	17a	18a	19a	20a
Interface Name	T Complex CH-TRU	B Complex CH-TRU	CH-TRU Packaging Off-gas	Supp. TRU Treatment Facility	CH-TRU to WIPP	CH-TRU 2nd Liquid Waste	T Complex Waste	T Complex Waste from WRF	U Farm Waste	S Complex Waste	222-S Lab Waste	Cross Site Waste Transfer	MUST / IMUST Waste	B Complex Waste	B Complex Waste	C Farm Waste	A Complex Waste
Solids Volume (gal)	-	1.06E+04	6.00E-03	1.06E+04	1.06E+04	7.66E+00	-	-	-	-	-	-	-	-	-	1.67E+05	6.42E+04
Liquid Volume (gal)	-	1.69E+06	-6.32E-04	5.03E+03	5.03E+03	1.52E+06	-	-	-	-	4.00E+04	-	-	-	-	1.63E+06	5.23E+06
Total Volume (gal)	-	1.71E+06	5.00E-03	1.56E+04	1.56E+04	1.52E+06	-	-	-	-	4.00E+04	-	-	-	-	1.80E+06	5.29E+06
Wt% Solids (wt%)	-	1.85	-	82.60	82.60	0.00	-	-	-	-	-	-	-	-	-	22.67	3.20
Liq. SpG	-	1.00	-	1.33	1.33	1.00	-	-	-	-	1.01	-	-	-	-	1.04	1.11
Radionuclides (Ci)																	
^{241}Am	-	1.91E+01	5.25E-09	1.90E+01	1.90E+01	1.33E-05	-	-	-	-	1.42E-01	-	-	-	-	2.04E+03	4.90E+03
^{137}Cs	-	2.04E+01	1.09E-11	2.04E+01	2.04E+01	2.04E-07	-	-	-	-	1.07E+01	-	-	-	-	1.06E+05	7.11E+05
^{129}I	-	7.59E-10	2.55E-13	5.59E-10	5.59E-10	2.00E-10	-	-	-	-	3.29E-15	-	-	-	-	4.32E-01	6.99E-01
^{238}Pu	-	1.33E+00	1.61E-10	1.33E+00	1.33E+00	3.98E-07	-	-	-	-	3.74E-04	-	-	-	-	8.78E+01	6.89E+01
^{239}Pu	-	1.65E+02	1.99E-08	1.64E+02	1.64E+02	4.92E-05	-	-	-	-	1.21E-02	-	-	-	-	4.17E+03	1.78E+03
^{241}Pu	-	1.04E+01	1.25E-09	1.04E+01	1.04E+01	3.10E-06	-	-	-	-	1.51E-02	-	-	-	-	2.75E+03	1.54E+03
^{99}Tc	-	6.58E-01	1.28E-06	6.58E-01	6.58E-01	6.59E-04	-	-	-	-	2.79E-06	-	-	-	-	9.56E+01	8.01E+02
^{90}Sr	-	4.26E+02	2.01E-07	4.25E+02	4.25E+02	1.87E-03	-	-	-	-	6.62E+00	-	-	-	-	6.71E+05	2.10E+06
^{233}U	-	2.21E-08	4.27E-14	2.21E-08	2.21E-08	2.21E-11	-	-	-	-	-	-	-	-	-	1.15E+02	1.37E+01
^{235}U	-	9.50E-04	1.84E-09	9.49E-04	9.49E-04	9.51E-07	-	-	-	-	2.98E-05	-	-	-	-	4.21E-01	1.12E-01
Total Activity	-	1.10E+03	5.39E-05	1.10E+03	1.10E+03	2.53E-01	-	-	-	-	7.51E+01	-	-	-	-	1.58E+06	5.99E+06
Chemical Components (kg)																	
Aluminum	-	3.75E+02	4.84E-04	3.74E+02	3.74E+02	2.50E-01	-	-	-	-	-	-	-	-	-	4.45E+05	1.22E+05
Bismuth	-	2.52E+04	3.92E-10	2.51E+04	2.51E+04	3.13E-03	-	-	-	-	-	-	-	-	-	6.84E+03	2.56E+02
Chlorine	-	5.05E+02	1.56E-04	5.03E+02	5.03E+02	9.69E-01	-	-	-	-	1.95E+02	-	-	-	-	2.50E+03	2.52E+04
Chromium	-	1.45E+03	9.45E-06	1.44E+03	1.44E+03	4.12E-02	-	-	-	-	-	-	-	-	-	1.26E+03	1.74E+04
Fluorine	-	3.13E+03	4.12E-05	3.11E+03	3.11E+03	1.30E-01	-	-	-	-	-	-	-	-	-	7.20E+03	3.32E+03
Iron	-	3.72E+03	7.20E-03	3.71E+03	3.71E+03	3.72E+00	-	-	-	-	-	-	-	-	-	3.68E+04	3.94E+04
Nickel	-	1.24E+02	2.39E-04	1.23E+02	1.23E+02	1.23E-01	-	-	-	-	-	-	-	-	-	1.15E+04	2.18E+03
Nitrate	-	2.70E+04	5.72E-03	2.68E+04	2.68E+04	4.72E+01	-	-	-	-	1.45E+03	-	-	-	-	1.04E+05	7.51E+05
Nitrite	-	4.05E+03	1.84E-04	4.03E+03	4.03E+03	1.68E+00	-	-	-	-	1.73E+02	-	-	-	-	4.09E+04	4.28E+05
Potassium	-	2.38E+03	1.31E-03	2.37E+03	2.37E+03	6.78E-01	-	-	-	-	-	-	-	-	-	2.28E+03	1.73E+04
Phosphate	-	4.71E+03	9.09E-03	4.69E+03	4.69E+03	4.69E+00	-	-	-	-	-	-	-	-	-	4.96E+04	6.00E+04
Sodium	-	1.84E+04	1.16E-03	1.83E+04	1.83E+04	6.10E-01	-	-	-	-	9.97E+02	-	-	-	-	2.85E+05	1.16E+06
Sulfate	-	3.03E+02	3.82E-05	3.03E+02	3.03E+02	2.17E-01	-	-	-	-	-	-	-	-	-	1.37E+04	1.20E+05
TOC	-	2.32E+02	1.29E-02	2.25E+02	2.25E+02	6.64E+00	-	-	-	-	-	-	-	-	-	5.84E+03	2.11E+04
Oxalate	-	2.09E+03	3.27E-11	2.09E+03	2.09E+03	2.61E-04	-	-	-	-	-	-	-	-	-	2.79E+03	1.46E+05
Zirconium	-	3.16E+00	4.92E-14	3.15E+00	3.15E+00	3.93E-07	-	-	-	-	-	-	-	-	-	5.30E+03	1.41E+03

Table 3-3. Phase 1 Summary Mass Flow (continued)

Interface Number	21	22a	22b	23	25	26	27a	27b	28	29	30a	31	32	33a	34a	35a	35b
Interface Name	Purex & T-Plant Waste	Evaporator Feed	Evaporator Bottoms	Evaporator Off-gas	Evaporator Secondary Liquid Waste	Tank Farm Effluent	Waste to LAW PS	Solids and Cs Return from LAW PS	DFLAW	WTP DFLAW Secondary Liquid Waste	HLW to TWCS	DFHLW	WTP DFHLW Secondary Liquid Waste	LAW Feed to WTP PT	HLW Feed to WTP PT	HLW	HLW Secondary Liquid Waste
Solids Volume (gal)	-	-	-	-	-	N/A	1.10E+02	1.10E+02	-	-	-	-	-	-	-	-	-
Liquid Volume (gal)	-	2.09E+07	1.22E+07	-	1.10E+07	N/A	2.55E+05	-	-	-	-	-	-	-	-	-	-
Total Volume (gal)	-	2.09E+07	1.22E+07	-	1.10E+07	N/A	2.55E+05	1.10E+02	-	-	-	-	-	-	-	-	-
Wt% Solids (wt%)	-	-	-	-	-	N/A	0.10	-	-	-	-	-	-	-	-	-	-
Liq. SpG	-	1.24	1.41	-	1.00	N/A	1.28	-	-	-	-	-	-	-	-	-	-
Radionuclides (Ci)																	
^{241}Am	-	1.75E+03	1.75E+03	6.86E-07	2.18E-03	N/A	9.32E+01	1.08E+00	-	-	-	-	-	-	-	-	-
^{137}Cs	-	1.25E+07	1.25E+07	4.84E-06	1.14E-01	N/A	1.43E+05	-	-	-	-	-	-	-	-	-	-
^{129}I	-	7.48E+00	7.48E+00	2.57E-07	2.34E-04	N/A	9.86E-02	1.51E-05	-	-	-	-	-	-	-	-	-
^{238}Pu	-	6.90E+00	6.90E+00	8.90E-10	2.78E-06	N/A	5.35E-02	1.11E-02	-	-	-	-	-	-	-	-	-
^{239}Pu	-	9.81E+01	9.81E+01	1.61E-08	5.02E-05	N/A	1.52E+00	3.16E-01	-	-	-	-	-	-	-	-	-
^{241}Pu	-	1.13E+02	1.13E+02	1.46E-08	4.58E-05	N/A	1.17E+00	2.43E-01	-	-	-	-	-	-	-	-	-
^{99}Tc	-	7.98E+03	7.98E+03	1.48E-06	9.63E-04	N/A	8.71E+01	-	-	-	-	-	-	-	-	-	-
^{90}Sr	-	2.71E+04	2.71E+04	1.61E-05	1.88E-01	N/A	1.70E+03	7.51E+02	-	-	-	-	-	-	-	-	-
^{233}U	-	9.60E-01	9.60E-01	1.01E-09	6.55E-07	N/A	8.96E-03	5.96E-04	-	-	-	-	-	-	-	-	-
^{235}U	-	2.40E-02	2.40E-02	2.15E-11	1.40E-08	N/A	4.48E-04	2.98E-05	-	-	-	-	-	-	-	-	-
Total Activity	-	2.43E+07	2.43E+07	1.61E+00	1.24E+02	N/A	2.82E+05	1.86E+03	-	-	-	-	-	-	-	-	-
Chemical Components (kg)																	
Aluminum	-	2.21E+05	2.21E+05	9.57E-06	6.23E-03	N/A	4.14E+03	2.51E+02	-	-	-	-	-	-	-	-	-
Bismuth	-	1.76E+03	1.76E+03	8.95E-05	2.51E+00	N/A	2.86E+01	-	-	-	-	-	-	-	-	-	-
Chlorine	-	1.62E+05	1.62E+05	1.02E-04	7.88E-01	N/A	1.90E+03	-	-	-	-	-	-	-	-	-	-
Chromium	-	3.38E+04	3.38E+04	4.30E-06	2.30E-02	N/A	3.69E+02	3.34E-01	-	-	-	-	-	-	-	-	-
Fluorine	-	7.53E+04	7.53E+04	2.23E-03	4.27E+00	N/A	1.84E+03	1.75E+01	-	-	-	-	-	-	-	-	-
Iron	-	2.69E+03	2.69E+03	8.40E-03	4.19E+00	N/A	9.86E+01	1.52E+01	-	-	-	-	-	-	-	-	-
Nickel	-	7.96E+01	7.96E+01	9.80E-05	6.36E-02	N/A	3.64E+00	1.11E+00	-	-	-	-	-	-	-	-	-
Nitrate	-	7.57E+06	7.57E+06	1.66E-06	2.06E+00	N/A	9.10E+04	-	-	-	-	-	-	-	-	-	-
Nitrite	-	3.23E+06	3.23E+06	4.20E-06	4.38E-02	N/A	4.03E+04	-	-	-	-	-	-	-	-	-	-
Potassium	-	3.56E+05	3.56E+05	4.61E-04	2.95E-01	N/A	6.83E+03	-	-	-	-	-	-	-	-	-	-
Phosphate	-	3.01E+05	3.01E+05	2.95E-04	1.92E-01	N/A	3.41E+03	-	-	-	-	-	-	-	-	-	-
Sodium	-	8.57E+06	8.57E+06	3.86E-03	2.42E+00	N/A	1.27E+05	1.68E+02	-	-	-	-	-	-	-	-	-
Sulfate	-	5.21E+05	5.21E+05	1.76E-03	7.42E+00	N/A	1.28E+04	8.87E+01	-	-	-	-	-	-	-	-	-
TOC	-	1.32E+05	1.32E+05	-	4.71E+02	N/A	1.90E+03	-	-	-	-	-	-	-	-	-	-
Oxalate	-	1.12E+05	1.04E+05	1.23E-02	8.03E+03	N/A	1.34E+03	1.99E+02	-	-	-	-	-	-	-	-	-
Zirconium	-	-	-	-	-	N/A	1.60E-02	1.60E-02	-	-	-	-	-	-	-	-	-

Table 3-3. Phase 1 Summary Mass Flow (continued)

Interface Number	36	37a	37b	38	39	40	41a	41b	42	43	45	46	47	48	49	50	51
Interface Name	**HLW Off-gas**	**HLW Secondary Solid Waste**	**LAW Secondary Solid Waste**	**IHLW**	**IHLW**	**IHLW**	**LAW**	**LAW Secondary Liquid Waste**	**LAW Off-gas**	**ILAW**	**WTP PT LAW to SLAW Immob.**	**LAW PS to SLAW Immob.**	**SLAW Immob. Off-gas**	**SLAW Immob. Secondary Liquid Waste**	**Supp. ILAW**	**WTP PT Off-gas**	**WTP PT Secondary Liquid Waste**
Solids Volume (gal)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Liquid Volume (gal)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Volume (gal)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wt% Solids (wt%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Liq. SpG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Radionuclides (Ci)																	
^{241}Am	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
^{137}Cs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
^{129}I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
^{238}Pu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
^{239}Pu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
^{241}Pu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
^{99}Tc	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
^{90}Sr	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
^{233}U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
^{235}U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Activity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chemical Components (kg)																	
Aluminum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bismuth	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chlorine	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluorine	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrite	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phosphate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulfate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oxalate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zirconium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 3-3. Phase 1 Summary Mass Flow (continued)

Interface Number	60a	61a	62a	64	65	66	69	70	72	73	74	76	79
Interface Name	WTP PT Utilities	WTP LAW Utilities	WTP HLW Utilities	LERF/ETF Wastewater	LERF/ETF Solid Waste	SST Utilities	WRF Utilities	DST-Utilities	242-A Utilities - Process Water	LAW PS Utilities	TWCS Utilities	SLAW Immob. Utilities	SLAW Immob. Solid Waste
Solids Volume (gal)	-	-	-	1.20E-02	3.84E+02	-	-	-	-	-	-	-	-
Liquid Volume (gal)	-	-	-	8.20E+06	-	9.33E+06	-	2.19E+06	2.35E+06	2.94E+04	-	-	-
Total Volume (gal)	-	-	-	8.20E+06	3.84E+02	9.33E+06	-	2.19E+06	2.35E+06	2.94E+04	-	-	-
Wt% Solids (wt%)	-	-	-	0.00	-	-	-	-	-	-	-	-	-
Liq. SpG	-	-	-	1.00	-	1.01	-	1.01	1.00	1.01	-	-	-
Radionuclides (Ci)													
^{241}Am	-	-	-	5.46E-08	5.46E-05	-	-	-	-	-	-	-	-
^{137}Cs	-	-	-	8.68E-07	8.68E-02	-	-	-	-	-	-	-	-
^{129}I	-	-	-	1.74E-09	1.74E-04	-	-	-	-	-	-	-	-
^{238}Pu	-	-	-	1.91E-09	1.91E-06	-	-	-	-	-	-	-	-
^{239}Pu	-	-	-	4.17E-08	4.17E-05	-	-	-	-	-	-	-	-
^{241}Pu	-	-	-	2.52E-08	2.52E-05	-	-	-	-	-	-	-	-
^{99}Tc	-	-	-	6.64E-09	6.64E-04	-	-	-	-	-	-	-	-
^{90}Sr	-	-	-	1.62E-07	1.62E-01	-	-	-	-	-	-	-	-
^{233}U	-	-	-	5.17E-10	5.16E-07	-	-	-	-	-	-	-	-
^{235}U	-	-	-	1.91E-10	1.91E-07	-	-	-	-	-	-	-	-
Total Activity	-	-	-	9.08E+01	9.13E+00	-	-	-	-	-	-	-	-
Chemical Components (kg)													
Aluminum	-	-	-	6.15E-05	6.15E-02	-	-	-	-	-	-	-	-
Bismuth	-	-	-	1.51E-03	1.51E+00	-	-	-	-	-	-	-	-
Chlorine	-	-	-	7.86E-04	7.85E-01	-	-	-	-	-	-	-	-
Chromium	-	-	-	2.40E-05	2.40E-02	-	-	-	-	-	-	-	-
Fluorine	-	-	-	2.26E-03	2.26E+00	-	-	-	-	-	-	-	-
Iron	-	-	-	3.77E-03	3.76E+00	-	-	-	-	-	-	-	-
Nickel	-	-	-	9.26E-05	9.25E-02	-	-	-	-	-	-	-	-
Nitrate	-	-	-	8.45E-03	8.44E+00	-	-	-	-	8.27E+02	-	-	-
Nitrite	-	-	-	3.44E-04	3.44E-01	7.10E+03	-	-	-	-	-	-	-
Potassium	-	-	-	2.49E-04	2.49E-01	-	-	-	-	-	-	-	-
Phosphate	-	-	-	1.27E-03	1.27E+00	-	-	-	-	-	-	-	-
Sodium	-	-	-	1.82E-03	1.82E+00	2.02E+05	-	3.65E+04	-	2.48E+02	-	-	-
Sulfate	-	-	-	5.11E-03	5.10E+00	-	-	-	-	-	-	-	-
TOC	-	-	-	2.32E+01	3.09E+02	-	-	-	-	-	-	-	-
Oxalate	-	-	-	5.81E+03	-	2.05E+05	-	-	-	-	-	-	-
Zirconium	-	-	-	1.82E-10	1.81E-07	-	-	-	-	-	-	-	-

3.5.2 Phase 2 – Direct Feed Low-Activity Waste

Table 3-4 provides a summary mass flow of major interfaces and constituents of interest for Phase 2. The information was taken from SVF-2931. The interface numbers match those depicted in Figure 2-1 and Figure 2-3.

Table 3-4. Phase 2 Summary Mass Flow.

Interface Number	1a	2	3	4	5	6	7a	8a	9a	10a	13	15	16	17a	18a	19a	20a
Interface Name	T Complex CH-TRU	B Complex CH-TRU	CH-TRU Packaging Off-gas	Supp. TRU Treatment Facility	CH-TRU to WIPP	CH-TRU 2nd Liquid Waste	T Complex Waste	T Complex Waste from WRF	U Farm Waste	S Complex Waste	222-S Lab Waste	Cross Site Waste Transfer	MUST / IMUST Waste	B Complex Waste	B Complex Waste	C Farm Waste	A Complex Waste
Solids Volume (gal)	4.23E+04	4.19E+03	4.10E-02	4.61E+04	4.61E+04	4.15E+01	-	-	-	1.53E+04	-	9.79E+01	-	-	-	-	6.96E+03
Liquid Volume (gal)	1.43E+06	7.60E+05	-3.68E-04	1.92E+04	1.92E+04	1.96E+06	-	-	-	3.66E+05	4.00E+04	2.62E+05	-	-	-	-	1.29E+06
Total Volume (gal)	1.47E+06	7.64E+05	4.10E-02	6.52E+04	6.52E+04	1.96E+06	-	-	-	3.81E+05	4.00E+04	2.62E+05	-	-	-	-	1.30E+06
Wt% Solids (wt%)	8.13	1.63	-	86.52	86.52	0.01	-	-	-	11.10	-	0.10	-	-	-	-	1.57
Liq. SpG	1.00	1.00	-	1.12	1.12	1.00	-	-	-	1.00	1.01	1.12	-	-	-	-	1.02
Radionuclides (Ci)																	
^{241}Am	8.63E+01	8.70E+00	2.60E-08	9.42E+01	9.42E+01	6.58E-05	-	-	-	2.18E+01	1.41E-01	9.38E-02	-	-	-	-	3.58E+03
^{137}Cs	9.95E+01	1.79E+00	5.37E-11	1.00E+02	1.00E+02	1.00E-06	-	-	-	1.44E+04	8.78E+00	1.52E+04	-	-	-	-	-
^{129}I	1.08E-07	2.92E-11	3.60E-11	7.85E-08	7.85E-08	2.81E-08	-	-	-	2.40E-02	3.29E-15	4.46E-02	-	-	-	-	1.29E-03
^{238}Pu	1.62E+00	3.03E-01	2.32E-10	1.92E+00	1.92E+00	5.75E-07	-	-	-	3.71E-01	3.50E-04	2.77E-03	-	-	-	-	1.26E+01
^{239}Pu	3.55E+02	4.67E+01	4.84E-08	4.00E+02	4.00E+02	1.20E-04	-	-	-	1.44E+01	1.21E-02	4.02E-02	-	-	-	-	3.67E+02
^{241}Pu	2.39E+01	2.46E+00	3.18E-09	2.63E+01	2.63E+01	7.88E-06	-	-	-	6.43E+00	9.80E-03	1.68E-02	-	-	-	-	-
^{99}Tc	1.18E+01	-4.55E-06	2.26E-05	1.17E+01	1.17E+01	1.17E-02	-	-	-	1.00E+01	2.79E-06	1.18E+01	-	-	-	-	2.15E+01
^{90}Sr	3.77E+03	3.79E+01	1.74E-06	3.69E+03	3.69E+03	1.62E-02	-	-	-	1.93E+04	5.40E+00	3.57E+00	-	-	-	-	9.83E+05
^{233}U	1.86E-06	7.20E-11	3.56E-12	1.84E-06	1.84E-06	1.84E-09	-	-	-	1.06E-01		1.30E-02	-	-	-	-	-2.38E-04
^{235}U	7.69E-02	2.68E-06	1.47E-07	7.59E-02	7.59E-02	7.60E-05	-	-	-	3.26E-02	2.98E-05	3.16E-04	-	-	-	-	2.42E-05
Total Activity	8.28E+03	7.52E+00	3.63E-05	8.17E+03	8.17E+03	4.84E-03	-	-	-	6.80E+04	6.90E+01	3.00E+04	-	-	-	-	2.02E+06
Chemical Components (kg)																	
Aluminum	5.59E+02	1.34E+01	7.31E-04	5.65E+02	5.65E+02	3.77E-01	-	-	-	1.49E+04	-	1.86E+03	-	-	-	-	5.47E+03
Bismuth	6.50E+04	1.11E+04	1.18E-09	7.58E+04	7.58E+04	9.47E-03	-	-	-	6.81E+00	-	1.26E+01	-	-	-	-	-
Chlorine	1.67E+03	1.54E+02	5.61E-04	1.80E+03	1.80E+03	3.48E+00	-	-	-	9.01E+02	1.95E+02	8.15E+02	-	-	-	-	7.09E+01
Chromium	4.65E+03	7.62E+02	3.57E-05	5.39E+03	5.39E+03	1.55E-01	-	-	-	7.64E+02	-	9.97E+01	-	-	-	-	4.48E+02
Fluorine	9.86E+03	1.54E+03	1.50E-04	1.13E+04	1.13E+04	4.74E-01	-	-	-	3.46E+02	-	4.92E+02	-	-	-	-	2.29E+01
Iron	2.64E+04	8.52E+02	5.23E-02	2.70E+04	2.70E+04	2.70E+01	-	-	-	2.63E+02	-	1.71E+00	-	-	-	-	1.27E+04
Nickel	2.80E+02	5.34E+01	6.42E-04	3.31E+02	3.31E+02	3.32E-01	-	-	-	6.99E+00	-	8.17E-01	-	-	-	-	1.84E+03
Nitrate	1.16E+05	1.17E+04	2.69E-02	1.26E+05	1.26E+05	2.23E+02	-	-	-	6.20E+04	1.45E+03	5.45E+04	-	-	-	-	1.26E+04
Nitrite	4.56E+03	1.82E+03	2.96E-04	6.37E+03	6.37E+03	2.67E+00	-	-	-	9.48E+03	1.73E+02	8.78E+03	-	-	-	-	2.96E+03
Potassium	4.63E+03	1.34E+03	3.30E-03	5.97E+03	5.97E+03	1.71E+00	-	-	-	2.12E+02	-	2.53E+02	-	-	-	-	2.84E+01
Phosphate	4.92E+04	1.63E+03	9.74E-02	5.03E+04	5.03E+04	5.03E+01	-	-	-	1.03E+04	-	9.86E+03	-	-	-	-	7.23E+03
Sodium	6.79E+04	7.62E+03	4.82E-03	7.50E+04	7.50E+04	2.51E+00	-	-	-	4.36E+04	9.97E+02	5.31E+04	-	-	-	-	9.06E+04
Sulfate	5.21E+03	6.59E+01	6.58E-04	5.21E+03	5.21E+03	3.74E+00	-	-	-	1.03E+03	-	2.08E+03	-	-	-	-	6.71E+03
TOC	3.06E+03	2.74E-01	1.68E-01	2.94E+03	2.94E+03	8.66E+01	-	-	-	4.30E+02	-	3.84E+02	-	-	-	-	
Oxalate	8.43E+03	3.94E+02	1.36E-10	8.73E+03	8.73E+03	1.09E-03	-	-	-	3.03E+03	-	2.01E+03	-	-	-	-	1.15E+05
Zirconium	2.78E+00	5.72E-01	5.22E-14	3.34E+00	3.34E+00	4.18E-07	-	-	-	6.04E+00	-	-	-	-	-	-	7.76E+02

Table 3-4. Phase 2 Summary Mass Flow (continued)

Interface Number	21	22a	22b	23	25	27a	27b	28	29	30a	31	32	33a	34a	35a	35b	36
Interface Name	**Purex & T-Plant Waste**	**Evaporator Feed**	**Evaporator Bottoms**	**Evaporator Off-gas**	**Evaporator Secondary Liquid Waste**	**Waste to LAW PS**	**Solids and Cs Return from LAW PS**	**DFLAW**	**WTP DFLAW Secondary Liquid Waste**	**HLW to TWCS**	**DFHLW**	**WTP DFHLW Secondary Liquid Waste**	**LAW Feed to WTP PT**	**HLW Feed to WTP PT**	**HLW**	**HLW Secondary Liquid Waste**	**HLW Off-gas**
Solids Volume (gal)	-	-	-	-	-	2.22E+03	2.22E+03	1.25E+00	6.00E-03	5.91E+04	-	-	-	-	-	-	-
Liquid Volume (gal)	-	8.75E+06	4.86E+06	1.38E+02	4.66E+06	5.13E+06	1.18E+06	5.17E+06	5.33E+06	9.72E+05	-	-	-	-	-	-	-
Total Volume (gal)	-	8.75E+06	4.86E+06	1.38E+02	4.66E+06	5.13E+06	1.18E+06	5.17E+06	5.33E+06	1.03E+06	-	-	-	-	-	-	-
Wt% Solids (wt%)	-	-	-	-	-	0.10	0.59	0.00	0.00	15.00	-	-	-	-	-	-	-
Liq. SpG	-	1.19	1.34	1.15	1.00	1.28	1.01	1.28	1.01	1.03	-	-	-	-	-	-	-
Radionuclides (Ci)																	
^{241}Am	-	5.42E+02	5.42E+02	1.78E-07	5.57E-04	4.83E+02	2.44E+01	5.49E+02	1.01E+01	3.03E+04	-	-	-	-	-	-	-
^{137}Cs	-	3.35E+06	3.35E+06	1.44E-06	3.38E-02	3.16E+06	3.10E+06	9.41E+02	2.22E+02	1.10E+05	-	-	-	-	-	-	-
^{129}I	-	3.49E+00	3.49E+00	1.19E-07	1.08E-04	2.29E+00	4.42E-04	2.28E+00	7.63E-01	1.22E-01	-	-	-	-	-	-	-
^{238}Pu	-	1.40E+00	1.40E+00	1.70E-10	5.31E-07	2.56E+00	4.09E-01	1.91E+00	1.69E-02	2.08E+02	-	-	-	-	-	-	-
^{239}Pu	-	2.09E+01	2.09E+01	2.72E-09	8.51E-06	3.86E+01	7.00E+00	2.95E+01	2.65E-01	2.93E+03	-	-	-	-	-	-	-
^{241}Pu	-	7.50E+00	7.50E+00	7.75E-10	2.42E-06	3.28E+01	5.71E+00	2.49E+01	2.23E-01	3.54E+03	-	-	-	-	-	-	-
^{99}Tc	-	4.43E+03	4.43E+03	8.66E-07	5.61E-04	2.38E+03		2.36E+03	1.45E+03	5.43E+01	-	-	-	-	-	-	-
^{90}Sr	-	7.77E+03	7.77E+03	4.49E-06	5.25E-02	2.73E+04	1.35E+04	1.43E+04	1.33E+02	4.68E+06	-	-	-	-	-	-	-
^{233}U	-	1.38E-01	1.38E-01	1.23E-10	7.97E-08	1.85E-01	2.68E-02	1.60E-01	1.48E-03	1.18E+00	-	-	-	-	-	-	-
^{235}U	-	4.02E-03	4.02E-03	3.81E-12	2.47E-09	6.15E-03	8.22E-04	5.58E-03	5.19E-05	2.08E-01	-	-	-	-	-	-	-
Total Activity	-	6.54E+06	6.54E+06	4.11E-02	2.56E+00	6.22E+06	6.07E+06	3.38E+04	2.20E+03	9.86E+06	-	-	-	-	-	-	-
Chemical Components (kg)																	
Aluminum	-	9.04E+04	9.04E+04	3.51E-06	2.27E-03	8.41E+04	5.84E+03	7.88E+04	1.48E+02	1.29E+05	-	-	-	-	-	-	-
Bismuth	-	6.76E+02	6.76E+02	3.20E-05	8.92E-01	3.93E+02	-	4.07E+02	7.43E+00	4.11E+03	-	-	-	-	-	-	-
Chlorine	-	8.60E+04	8.60E+04	4.91E-05	3.78E-01	5.21E+04		5.16E+04	2.18E+04	7.42E+02	-	-	-	-	-	-	-
Chromium	-	1.07E+04	1.07E+04	1.44E-06	7.68E-03	8.55E+03	8.90E+00	8.53E+03	5.86E+02	1.79E+03	-	-	-	-	-	-	-
Fluorine	-	1.98E+04	1.98E+04	6.50E-04	1.23E+00	1.86E+04	6.01E+01	1.97E+04	8.67E+03	1.59E+03	-	-	-	-	-	-	-
Iron	-	7.21E+02	7.21E+02	2.06E-03	1.03E+00	1.79E+03	2.06E+02	1.62E+03	2.96E+00	1.14E+05	-	-	-	-	-	-	-
Nickel	-	1.95E+01	1.95E+01	2.35E-05	1.52E-02	7.13E+01	2.39E+01	4.78E+01	4.42E-01	5.98E+03	-	-	-	-	-	-	-
Nitrate	-	2.48E+06	2.48E+06	5.16E-07	8.65E-01	2.15E+06	3.31E+04	2.13E+06	9.17E+04	3.57E+04	-	-	-	-	-	-	-
Nitrite	-	1.20E+06	1.20E+06	1.40E-06	1.46E-02	8.99E+05	-	9.02E+05	1.76E+04	1.96E+04	-	-	-	-	-	-	-
Potassium	-	1.40E+05	1.40E+05	1.90E-04	1.21E-01	9.30E+04	-	9.65E+04	4.72E+03	2.15E+03	-	-	-	-	-	-	-
Phosphate	-	1.17E+05	1.17E+05	1.15E-04	7.45E-02	7.93E+04	-	7.89E+04	8.57E+02	1.56E+04	-	-	-	-	-	-	-
Sodium	-	3.06E+06	3.06E+06	1.26E-03	7.84E-01	2.54E+06	1.23E+04	2.55E+06	9.57E+04	5.74E+04	-	-	-	-	-	-	-
Sulfate	-	1.71E+05	1.71E+05	5.53E-04	2.33E+00	1.59E+05	3.04E+02	1.66E+05	4.52E+04	3.63E+03	-	-	-	-	-	-	-
TOC	-	5.50E+04	5.50E+04	-	1.66E+02	4.12E+04	-	4.14E+04	-	9.46E+02	-	-	-	-	-	-	-
Oxalate	-	4.26E+04	3.96E+04	4.62E-03	3.02E+03	2.56E+04	4.60E+03	2.13E+04	-	3.34E+03	-	-	-	-	-	-	-
Zirconium	-	-	-	-	-	4.45E-01	4.45E-01	2.42E-08	5.08E-12	5.27E+03	-	-	-	-	-	-	-

Table 3-4. Phase 2 Summary Mass Flow (continued)

Interface Number	37a	37b	38	39	40	41a	41b	42	43	45	46	47	48	49	50	51	60a
Interface Name	**HLW Secondary Solid Waste**	**LAW Secondary Solid Waste**	**IHLW**	**IHLW**	**IHLW**	**LAW**	**LAW Secondary Liquid Waste**	**LAW Off-gas**	**ILAW**	**WTP PT LAW to SLAW Immob.**	**LAW PS to SLAW Immob.**	**SLAW Immob. Off-gas**	**SLAW Immob. Secondary Liquid Waste**	**Supp. ILAW**	**WTP PT Off-gas**	**WTP PT Secondary Liquid Waste**	**WTP PT Utilities**
Solids Volume (gal)	-	-	-	-	-	-	-	1.54E-11	-	-	-	-	-	-	-	-	-
Liquid Volume (gal)	-	-	-	-	-	-	-	2.00E-03	-	-	-	-	-	-	-	-	-
Total Volume (gal)	-	-	-	-	-	-	-	2.00E-03	-	-	-	-	-	-	-	-	-
Wt% Solids (wt%)	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-
Liq. SpG	-	-	-	-	-	-	-	1.01	-	-	-	-	-	-	-	-	-
Radionuclides (Ci)																	
^{241}Am	-	5.20E-02	-	-	-	-	-	7.19E-11	5.38E+02	-	-	-	-	-	-	-	-
^{137}Cs	-	2.51E+00	-	-	-	-	-	1.12E-06	7.07E+02	-	-	-	-	-	-	-	-
^{129}I	-	1.70E-01	-	-	-	-	-	1.71E-03	1.32E+00	-	-	-	-	-	-	-	-
^{238}Pu	-	1.89E-03	-	-	-	-	-	1.26E-13	1.86E+00	-	-	-	-	-	-	-	-
^{239}Pu	-	2.54E-02	-	-	-	-	-	1.95E-12	2.88E+01	-	-	-	-	-	-	-	-
^{241}Pu	-	2.30E-02	-	-	-	-	-	1.65E-12	2.44E+01	-	-	-	-	-	-	-	-
^{99}Tc	-	1.23E+00	-	-	-	-	-	1.80E-07	8.81E+02	-	-	-	-	-	-	-	-
^{90}Sr	-	1.23E+01	-	-	-	-	-	1.20E-10	1.41E+04	-	-	-	-	-	-	-	-
^{233}U	-	1.73E-04	-	-	-	-	-	1.07E-14	1.58E-01	-	-	-	-	-	-	-	-
^{235}U	-	4.78E-06	-	-	-	-	-	3.71E-16	5.50E-03	-	-	-	-	-	-	-	-
Total Activity	-	3.13E+01	-	-	-	-	-	3.41E+01	3.14E+04	-	-	-	-	-	-	-	-
Chemical Components (kg)																	
Aluminum	-	5.74E+02	-	-	-	-	-	1.79E-07	6.29E+05	-	-	-	-	-	-	-	-
Bismuth	-	3.36E-01	-	-	-	-	-	9.03E-11	3.98E+02	-	-	-	-	-	-	-	-
Chlorine	-	3.64E+03	-	-	-	-	-	3.34E-01	2.55E+04	-	-	-	-	-	-	-	-
Chromium	-	1.98E+01	-	-	-	-	-	7.05E-06	7.87E+03	-	-	-	-	-	-	-	-
Fluorine	-	1.65E+03	-	-	-	-	-	4.69E-01	9.17E+03	-	-	-	-	-	-	-	-
Iron	-	6.90E+02	-	-	-	-	-	1.85E-09	7.56E+05	-	-	-	-	-	-	-	-
Nickel	-	5.16E-02	-	-	-	-	-	6.74E-11	4.71E+01	-	-	-	-	-	-	-	-
Nitrate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrite	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	-	1.03E+02	-	-	-	-	-	1.81E-05	9.13E+04	-	-	-	-	-	-	-	-
Phosphate	-	6.34E+01	-	-	-	-	-	3.80E-05	-	-	-	-	-	-	-	-	-
Sodium	-	2.71E+03	-	-	-	-	-	8.73E-05	2.51E+06	-	-	-	-	-	-	-	-
Sulfate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oxalate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zirconium	-	3.95E+02	-	-	-	-	-	7.30E-20	4.32E+05	-	-	-	-	-	-	-	-

Table 3-4. Phase 2 Summary Mass Flow (continued)

Interface Number	61a	62a	64	65	66	69	70	72	73	74	76	79
Interface Name	WTP LAW Utilities	WTP HLW Utilities	LERF/ETF Wastewater	LERF/ETF Solid Waste	SST Utilities	WRF Utilities	DST-Utilities	242-A Utilities - Process Water	LAW PS Utilities	TWCS Utilities	SLAW Immob. Utilities	SLAW Immob. Solid Waste
Solids Volume (gal)	-	-	4.40E-02	5.49E+02	-	-	-	-	-	-	-	-
Liquid Volume (gal)	2.31E+06	-	7.63E+06	-	1.43E+06	-	1.92E+06	1.05E+06	1.19E+06	6.30E+03	-	-
Total Volume (gal)	2.31E+06	-	7.63E+06	5.49E+02	1.43E+06	-	1.92E+06	1.05E+06	1.19E+06	6.30E+03	-	-
Wt% Solids (wt%)	-	-	0.00	-	-	-	-	-	-	-	-	-
Liq. SpG	1.01	-	1.00	-	1.00	-	1.04	1.00	1.01	1.00	-	-
Radionuclides (Ci)												
^{241}Am	-	-	2.43E-06	2.43E-03	-	-	-	-	-	-	-	-
^{137}Cs	-	-	3.86E-07	3.86E-02	-	-	-	-	-	-	-	-
^{129}I	-	-	1.09E-09	1.09E-04	-	-	-	-	-	-	-	-
^{238}Pu	-	-	1.64E-09	1.64E-06	-	-	-	-	-	-	-	-
^{239}Pu	-	-	1.04E-07	1.04E-04	-	-	-	-	-	-	-	-
^{241}Pu	-	-	2.23E-08	2.23E-05	-	-	-	-	-	-	-	-
^{99}Tc	-	-	1.19E-08	1.19E-03	-	-	-	-	-	-	-	-
^{90}Sr	-	-	5.66E-08	5.66E-02	-	-	-	-	-	-	-	-
^{233}U	-	-	1.72E-10	1.72E-07	-	-	-	-	-	-	-	-
^{235}U	-	-	8.74E-10	8.73E-07	-	-	-	-	-	-	-	-
Total Activity	-	-	1.09E+01	4.14E-01	-	-	-	-	-	-	-	-
Chemical Components (kg)												
Aluminum	5.52E+05	-	2.08E-04	2.08E-01	-	-	-	-	-	-	-	-
Bismuth	-	-	1.32E-03	1.32E+00	-	-	-	-	-	-	-	-
Chlorine	-	-	1.79E-03	1.79E+00	-	-	-	-	-	-	-	-
Chromium	-	-	8.77E-05	8.76E-02	-	-	-	-	-	-	-	-
Fluorine	-	-	2.74E-03	2.74E+00	-	-	-	-	-	-	-	-
Iron	7.57E+05	-	6.73E-03	6.72E+00	-	-	-	-	-	-	-	-
Nickel	-	-	2.08E-04	2.07E-01	-	-	-	-	-	-	-	-
Nitrate	-	-	7.89E-02	7.88E+01	-	-	-	-	3.31E+04	-	-	-
Nitrite	-	-	2.52E-03	2.52E+00	3.01E+03	-	6.55E+02	-	1.78E+04	1.21E+01	-	-
Potassium	-	-	1.47E-03	1.47E+00	-	-	-	-	-	-	-	-
Phosphate	-	-	6.72E-03	6.72E+00	-	-	-	-	-	-	-	-
Sodium	5.13E+04	-	2.09E-03	2.09E+00	2.20E+03	-	1.63E+05	-	2.35E+04	1.15E+01	-	-
Sulfate	-	-	3.87E-03	3.86E+00	-	-	-	-	-	-	-	-
TOC	-	-	1.65E+01	2.19E+02	-	-	-	-	-	-	-	-
Oxalate	-	-	4.21E+03	-	-	-	-	-	-	-	-	-
Zirconium	4.34E+05	-	3.66E-10	3.66E-07	-	-	-	-	-	-	-	-

3.5.3 Phase 3 – Direct Feed High-Level Waste

Table 3-5 provides a summary mass flow of major interfaces and constituents of interest for Phase 3. The information was taken from SVF-2931. The interface numbers match those depicted in Figure 2-1 and Figure 2-4.

Table 3-5. Phase 3 Summary Mass Flow

Interface Number	1a	2	3	4	5	6	7a	8a	9a	10a	13	15	16	17a	18a	19a	20a
Interface Name	T Complex CH-TRU	B Complex CH-TRU	CH-TRU Packaging Off-gas	Supp. TRU Treatment Facility	CH-TRU to WIPP	CH-TRU 2nd Liquid Waste	T Complex Waste	T Complex Waste from WRF	U Farm Waste	S Complex Waste	222-S Lab Waste	Cross Site Waste Transfer	MUST / IMUST Waste	B Complex Waste	B Complex Waste	C Farm Waste	A Complex Waste
Solids Volume (gal)	8.68E+04	-	7.10E-02	8.69E+04	8.69E+04	7.53E+01	-	-	-	-	-	9.35E+01	-	-	-	-	6.48E+03
Liquid Volume (gal)	1.03E+06	-	2.97E-04	3.38E+04	3.38E+04	8.95E+05	-	-	-	-	2.00E+04	2.52E+05	-	-	-	-	1.20E+05
Total Volume (gal)	1.12E+06	-	7.10E-02	1.21E+05	1.21E+05	8.95E+05	-	-	-	-	2.00E+04	2.52E+05	-	-	-	-	1.27E+05
Wt% Solids (wt%)	20.76	-	-	88.22	88.22	0.03	-	-	-	-	-	0.10	-	-	-	-	12.78
Liq. SpG	1.00	-	-	1.03	1.03	1.00	-	-	-	-	1.01	1.11	-	-	-	-	1.11
Radionuclides (Ci)																	
^{241}Am	6.06E+01	-	1.69E-08	6.12E+01	6.12E+01	4.27E-05	-	-	-	-	6.97E-02	1.35E-01	-	-	-	-	6.34E+02
^{137}Cs	1.83E+02	-	9.81E-11	1.83E+02	1.83E+02	1.82E-06	-	-	-	-	3.76E+00	1.22E+04	-	-	-	-	5.80E+03
^{129}I	5.10E-04	-	1.67E-07	3.74E-04	3.74E-04	1.33E-04	-	-	-	-	1.65E-15	3.98E-02	-	-	-	-	7.28E-03
^{238}Pu	2.82E+00	-	3.38E-10	2.79E+00	2.79E+00	8.34E-07	-	-	-	-	1.67E-04	2.52E-03	-	-	-	-	1.43E+01
^{239}Pu	3.48E+02	-	4.22E-08	3.49E+02	3.49E+02	1.04E-04	-	-	-	-	6.06E-03	4.03E-02	-	-	-	-	5.60E+02
^{241}Pu	3.45E+01	-	4.03E-09	3.34E+01	3.34E+01	9.97E-06	-	-	-	-	3.37E-03	1.62E-02	-	-	-	-	9.66E+01
^{99}Tc	5.19E+00	-	1.03E-05	5.33E+00	5.33E+00	5.35E-03	-	-	-	-	1.39E-06	1.05E+01	-	-	-	-	1.41E+01
^{90}Sr	2.93E+03	-	1.39E-06	2.94E+03	2.94E+03	1.29E-02	-	-	-	-	2.30E+00	5.14E+00	-	-	-	-	9.67E+05
^{233}U	1.13E-06	-	2.24E-12	1.15E-06	1.15E-06	1.16E-09	-	-	-	-		1.16E-02	-	-	-	-	1.82E-01
^{235}U	4.77E-02	-	9.40E-08	4.85E-02	4.85E-02	4.86E-05	-	-	-	-	1.49E-05	2.92E-04	-	-	-	-	2.02E-02
Total Activity	6.81E+03	-	3.12E-05	6.85E+03	6.85E+03	4.96E-02	-	-	-	-	3.25E+01	2.42E+04	-	-	-	-	1.97E+06
Chemical Components (kg)																	
Aluminum	2.69E+04	-	3.45E-02	2.67E+04	2.67E+04	1.78E+01	-	-	-	-	-	1.68E+03	-	-	-	-	6.64E+03
Bismuth	7.02E+04	-	1.10E-09	7.04E+04	7.04E+04	8.79E-03	-	-	-	-	-	1.12E+01	-	-	-	-	8.05E-02
Chlorine	2.43E+03	-	7.57E-04	2.43E+03	2.43E+03	4.69E+00	-	-	-	-	9.74E+01	7.99E+02	-	-	-	-	1.29E+02
Chromium	4.14E+03	-	2.79E-05	4.16E+03	4.16E+03	1.19E-01	-	-	-	-	-	8.89E+01	-	-	-	-	1.50E+02
Fluorine	1.74E+04	-	2.30E-04	1.74E+04	1.74E+04	7.23E-01	-	-	-	-	-	4.38E+02	-	-	-	-	2.12E+00
Iron	4.25E+04	-	8.28E-02	4.27E+04	4.27E+04	4.27E+01	-	-	-	-	-	1.52E+00	-	-	-	-	2.43E+04
Nickel	1.41E+02	-	2.77E-04	1.43E+02	1.43E+02	1.43E-01	-	-	-	-	-	7.70E-01	-	-	-	-	1.58E+03
Nitrate	2.18E+05	-	4.66E-02	2.19E+05	2.19E+05	3.84E+02	-	-	-	-	7.25E+02	4.91E+04	-	-	-	-	2.73E+02
Nitrite	3.41E+04	-	1.71E-03	3.41E+04	3.41E+04	1.42E+01	-	-	-	-	8.67E+01	7.89E+03	-	-	-	-	6.76E+03
Potassium	1.68E+03	-	9.39E-04	1.69E+03	1.69E+03	4.86E-01	-	-	-	-	-	2.25E+02	-	-	-	-	5.72E+01
Phosphate	1.68E+05	-	3.25E-01	1.68E+05	1.68E+05	1.68E+02	-	-	-	-	-	8.79E+03	-	-	-	-	5.67E+02
Sodium	2.05E+05	-	1.32E-02	2.05E+05	2.05E+05	6.84E+00	-	-	-	-	4.98E+02	4.77E+04	-	-	-	-	3.23E+04
Sulfate	1.82E+04	-	2.29E-03	1.82E+04	1.82E+04	1.30E+01	-	-	-	-	-	1.86E+03	-	-	-	-	1.50E+03
TOC	2.83E+03	-	1.59E-01	2.78E+03	2.78E+03	8.21E+01	-	-	-	-	-	3.42E+02	-	-	-	-	-
Oxalate	3.76E+03	-	6.03E-11	3.86E+03	3.86E+03	4.83E-04	-	-	-	-	-	1.79E+03	-	-	-	-	-
Zirconium	1.09E+02	-	1.70E-12	1.09E+02	1.09E+02	1.35E-05	-	-	-	-	-	-	-	-	-	-	1.63E+01

Table 3-5. Phase 3 Summary Mass Flow (continued)

Interface Number	21	22a	22b	23	25	27a	27b	28	29	30a	31	32	33a	34a	35a	35b	36
Interface Name	Purex & T-Plant Waste	Evaporator Feed	Evaporator Bottoms	Evaporator Off-gas	Evaporator Secondary Liquid Waste	Waste to LAW PS	Solids and Cs Return from LAW PS	DFLAW	WTP DFLAW Secondary Liquid Waste	HLW to TWCS	DFHLW	WTP DFHLW Secondary Liquid Waste	LAW Feed to WTP PT	HLW Feed to WTP PT	HLW	HLW Secondary Liquid Waste	HLW Off-gas
Solids Volume (gal)	-	-	-	-	-	9.99E+02	9.99E+02	8.00E-02	1.00E-03	7.91E+04	3.63E+04	2.36E+02	-	-	-	-	8.37E-10
Liquid Volume (gal)	-	9.45E+06	4.56E+06	2.37E+02	6.50E+06	2.31E+06	5.28E+05	2.33E+06	2.47E+06	2.16E+06	1.14E+06	1.59E+06	-	-	-	-	1.99E-05
Total Volume (gal)	-	9.45E+06	4.56E+06	2.37E+02	6.50E+06	2.31E+06	5.29E+05	2.33E+06	2.47E+06	2.24E+06	1.18E+06	1.59E+06	-	-	-	-	1.99E-05
Wt% Solids (wt%)	-	-	-	-	-	0.10	0.56	0.00	0.00	8.27	8.55	0.04	-	-	-	-	0.01
Liq. SpG	-	1.12	1.26	1.09	1.00	1.28	1.01	1.28	1.01	1.19	1.02	1.01	-	-	-	-	1.00
Radionuclides (Ci)																	
^{241}Am	-	4.04E+02	4.04E+02	1.61E-07	5.04E-04	5.83E+01	1.90E+01	3.64E+01	6.61E-01	1.34E+04	1.74E+04	3.40E+02	-	-	-	-	1.32E-11
^{137}Cs	-	2.59E+06	2.59E+06	1.78E-06	4.16E-02	1.41E+06	1.41E+06	4.28E+02	1.06E+02	1.10E+06	6.67E+04	1.37E+03	-	-	-	-	4.35E-08
^{129}I	-	4.87E+00	4.87E+00	2.46E-07	2.23E-04	1.27E+00	3.30E-04	1.26E+00	4.35E-01	8.04E-01	7.60E-02	4.62E-02	-	-	-	-	1.07E-05
^{238}Pu	-	6.81E-01	6.81E-01	1.16E-10	3.63E-07	1.69E+00	8.05E-02	1.76E+00	1.74E-02	1.74E+02	1.19E+02	1.51E+00	-	-	-	-	5.88E-14
^{239}Pu	-	1.19E+01	1.19E+01	2.02E-09	6.30E-06	1.90E+01	9.69E-01	1.99E+01	1.97E-01	2.50E+03	1.75E+03	2.21E+01	-	-	-	-	8.67E-13
^{241}Pu	-	9.44E-01	9.44E-01	5.44E-10	1.70E-06	1.53E+01	3.68E-01	1.65E+01	1.64E-01	1.15E+03	1.86E+03	2.37E+01	-	-	-	-	9.22E-13
^{99}Tc	-	6.34E+03	6.34E+03	1.79E-06	1.16E-03	1.13E+03	-	1.13E+03	7.12E+02	5.80E+02	3.36E+01	2.04E+01	-	-	-	-	8.09E-13
^{90}Sr	-	2.26E+04	2.26E+04	1.82E-05	2.13E-01	8.30E+03	4.75E+03	3.64E+03	3.53E+01	2.60E+06	2.60E+06	2.86E+04	-	-	-	-	9.24E-07
^{233}U	-	6.27E-02	6.27E-02	7.31E-11	4.74E-08	7.42E-02	1.85E-02	5.70E-02	5.50E-04	4.73E+00	7.82E-01	9.61E-03	-	-	-	-	3.85E-16
^{235}U	-	2.65E-03	2.65E-03	3.21E-12	2.08E-09	1.90E-03	4.74E-04	1.47E-03	1.42E-05	2.11E-01	1.28E-01	1.60E-03	-	-	-	-	6.32E-17
Total Activity	-	5.09E+06	5.09E+06	2.68E-01	1.94E+01	2.75E+06	2.76E+06	9.46E+03	1.00E+03	7.61E+06	5.50E+06	6.22E+04	-	-	-	-	3.37E-01
Chemical Components (kg)																	
Aluminum	-	3.81E+04	3.81E+04	2.45E-06	1.59E-03	4.37E+04	2.83E+03	4.07E+04	7.90E+01	2.11E+05	8.00E+04	5.99E+02	-	-	-	-	1.83E-09
Bismuth	-	9.22E+02	9.22E+02	5.96E-05	1.67E+00	1.48E+02	-	1.48E+02	2.78E+00	1.16E+04	2.93E+03	1.02E+01	-	-	-	-	4.15E-13
Chlorine	-	1.05E+05	1.05E+05	9.28E-05	7.14E-01	2.72E+04	-	2.72E+04	1.19E+04	1.09E+04	4.71E+02	2.52E+02	-	-	-	-	8.39E-02
Chromium	-	9.03E+03	9.03E+03	1.77E-06	9.41E-03	3.98E+03	6.32E+00	4.00E+03	2.85E+02	7.51E+03	1.07E+03	1.35E+01	-	-	-	-	5.24E-10
Fluorine	-	1.77E+04	1.77E+04	7.78E-04	1.47E+00	6.58E+03	-	6.61E+03	3.01E+03	8.29E+03	1.09E+03	8.13E+02	-	-	-	-	1.52E-02
Iron	-	6.89E+02	6.89E+02	2.48E-03	1.24E+00	3.21E+02	1.34E+01	3.21E+02	6.13E-01	1.06E+05	6.80E+04	6.63E+02	-	-	-	-	5.14E-10
Nickel	-	4.31E+00	4.31E+00	1.07E-05	6.94E-03	3.40E+01	1.12E+01	2.29E+01	2.19E-01	7.46E+03	3.70E+03	3.05E+01	-	-	-	-	4.63E-10
Nitrate	-	1.72E+06	1.72E+06	5.41E-07	1.21E+00	1.04E+06	1.49E+04	1.06E+06	4.85E+04	5.51E+05	2.26E+04	4.36E+03	-	-	-	-	
Nitrite	-	7.60E+05	7.60E+05	1.36E-06	1.41E-02	4.24E+05	-	4.24E+05	9.75E+03	2.37E+05	1.33E+04	3.12E+03	-	-	-	-	
Potassium	-	8.76E+04	8.76E+04	1.58E-04	1.00E-01	3.62E+04	-	3.62E+04	1.82E+03	2.39E+04	1.30E+03	3.98E+01	-	-	-	-	1.48E-09
Phosphate	-	9.69E+04	9.69E+04	1.26E-04	8.16E-02	3.78E+04	-	3.82E+04	4.31E+02	7.18E+04	1.08E+04	1.07E+02	-	-	-	-	9.52E-09
Sodium	-	2.06E+06	2.06E+06	1.27E-03	7.94E-01	1.13E+06	5.37E+03	1.14E+06	4.64E+04	6.79E+05	3.78E+04	1.38E+04	-	-	-	-	1.18E-09
Sulfate	-	1.22E+05	1.22E+05	5.39E-04	2.27E+00	5.04E+04	-	5.10E+04	9.61E+03	2.74E+04	2.26E+03	1.09E+03	-	-	-	-	
TOC	-	3.98E+04	3.98E+04	-	1.86E+02	1.58E+04	-	1.61E+04	-	1.14E+04	6.03E+02	-	-	-	-	-	
Oxalate	-	8.76E+04	8.13E+04	9.69E-03	6.33E+03	1.04E+04	1.90E+03	8.56E+03	-	3.49E+04	2.29E+03	-	-	-	-	-	
Zirconium	-	-	-	-	-	6.90E-01	6.89E-01	3.53E-08	7.43E-12	3.12E+03	3.12E+03	1.84E+01	-	-	-	-	1.48E-10

Table 3-5. Phase 3 Summary Mass Flow (continued)

Interface Number	37a	37b	38	39	40	41a	41b	42	43	45	46	47	48	49	50	51	60a
Interface Name	HLW Secondary Solid Waste	LAW Secondary Solid Waste	IHLW	IHLW	IHLW	LAW	LAW Secondary Liquid Waste	LAW Off-gas	ILAW	WTP PT LAW to SLAW Immob.	LAW PS to SLAW Immob.	SLAW Immob. Off-gas	SLAW Immob. Secondary Liquid Waste	Supp. ILAW	WTP PT Off-gas	WTP PT Secondary Liquid Waste	WTP PT Utilities
Solids Volume (gal)	-	-	-	-	-	-	-	9.40E-13	-	-	-	-	-	-	-	-	-
Liquid Volume (gal)	-	-	-	-	-	-	-	1.00E-03	-	-	-	-	-	-	-	-	-
Total Volume (gal)	-	-	-	-	-	-	-	1.00E-03	-	-	-	-	-	-	-	-	-
Wt% Solids (wt%)	-	-	-	-	-	-	-	0.00	-	-	-	-	-	-	-	-	-
Liq. SpG	-	-	-	-	-	-	-	1.01	-	-	-	-	-	-	-	-	-
Radionuclides (Ci)																	
^{241}Am	2.20E-05	1.28E-01	1.70E+04	1.70E+04	1.70E+04	-	-	4.76E-12	3.55E+01	-	-	-	-	-	-	-	-
^{137}Cs	7.24E-02	1.71E+00	6.39E+04	6.39E+04	6.39E+04	-	-	5.15E-07	3.25E+02	-	-	-	-	-	-	-	-
^{129}I	1.07E-02	9.61E-02	1.72E-02	1.72E-02	1.72E-02	-	-	9.52E-04	7.36E-01	-	-	-	-	-	-	-	-
^{238}Pu	9.80E-08	3.25E-03	1.17E+02	1.17E+02	1.17E+02	-	-	1.19E-13	1.76E+00	-	-	-	-	-	-	-	-
^{239}Pu	1.45E-06	3.64E-02	1.71E+03	1.71E+03	1.71E+03	-	-	1.35E-12	1.99E+01	-	-	-	-	-	-	-	-
^{241}Pu	1.54E-06	3.63E-02	1.83E+03	1.83E+03	1.83E+03	-	-	1.12E-12	1.66E+01	-	-	-	-	-	-	-	-
^{99}Tc	1.35E-06	1.16E+00	1.24E+01	1.24E+01	1.24E+01	-	-	8.67E-08	4.23E+02	-	-	-	-	-	-	-	-
^{90}Sr	1.54E+00	8.71E+00	2.55E+06	2.55E+06	2.55E+06	-	-	3.10E-11	3.63E+03	-	-	-	-	-	-	-	-
^{233}U	6.42E-10	1.31E-04	7.51E-01	7.51E-01	7.51E-01	-	-	3.83E-15	5.67E-02	-	-	-	-	-	-	-	-
^{235}U	1.05E-10	3.34E-06	1.24E-01	1.24E-01	1.24E-01	-	-	9.85E-17	1.46E-03	-	-	-	-	-	-	-	-
Total Activity	3.23E+00	2.25E+01	5.40E+06	5.40E+06	5.40E+06	-	-	1.57E+01	8.50E+03	-	-	-	-	-	-	-	-
Chemical Components (kg)																	
Aluminum	3.05E-03	5.73E+02	7.80E+04	7.80E+04	7.80E+04	-	-	9.35E-08	2.52E+05	-	-	-	-	-	-	-	-
Bismuth	6.91E-07	3.62E-01	2.80E+03	2.80E+03	2.80E+03	-	-	3.30E-11	1.45E+02	-	-	-	-	-	-	-	-
Chlorine	8.38E+01	1.95E+03	1.22E+02	1.22E+02	1.22E+02	-	-	1.77E-01	1.35E+04	-	-	-	-	-	-	-	-
Chromium	8.73E-04	1.42E+01	1.05E+03	1.05E+03	1.05E+03	-	-	3.34E-06	3.72E+03	-	-	-	-	-	-	-	-
Fluorine	1.52E+01	5.67E+02	2.03E+02	2.03E+02	2.03E+02	-	-	1.59E-01	3.10E+03	-	-	-	-	-	-	-	-
Iron	8.57E-04	6.89E+02	6.67E+04	6.67E+04	6.67E+04	-	-	3.72E-10	3.03E+05	-	-	-	-	-	-	-	-
Nickel	7.71E-04	5.14E-02	3.61E+03	3.61E+03	3.61E+03	-	-	3.25E-11	2.27E+01	-	-	-	-	-	-	-	-
Nitrate		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrite		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	2.47E-03	9.47E+01	1.25E+03	1.25E+03	1.25E+03	-	-	6.87E-06	3.45E+04	-	-	-	-	-	-	-	-
Phosphate	1.59E-02	3.10E+01	-	-	-	-	-	1.86E-05	-	-	-	-	-	-	-	-	-
Sodium	1.96E-03	2.63E+03	6.99E+04	6.99E+04	6.99E+04	-	-	3.93E-05	1.13E+06	-	-	-	-	-	-	-	-
Sulfate		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOC		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oxalate		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zirconium	2.46E-04	3.94E+02	3.07E+03	3.07E+03	3.07E+03	-	-	1.07E-19	1.73E+05	-	-	-	-	-	-	-	-

Table 3-5. Phase 3 Summary Mass Flow (continued)

Interface Number	61a	62a	64	65	66	69	70	72	73	74	76	79
Interface Name	WTP LAW Utilities	WTP HLW Utilities	LERF/ETF Wastewater	LERF/ETF Solid Waste	SST Utilities	WRF Utilities	DST-Utilities	242-A Utilities - Process Water	LAW PS Utilities	TWCS Utilities	SLAW Immob. Utilities	SLAW Immob. Solid Waste
Solids Volume (gal)	-	-	1.03E+00	1.38E+03	-	-	-	-	-	-	-	-
Liquid Volume (gal)	7.27E+05	6.59E+05	7.84E+06	-	8.32E+05	-	1.78E+06	1.32E+06	5.55E+05	3.95E+04	-	-
Total Volume (gal)	7.27E+05	6.59E+05	7.84E+06	1.38E+03	8.32E+05	-	1.78E+06	1.32E+06	5.55E+05	3.95E+04	-	-
Wt% Solids (wt%)	-	-	0.00	-	-	-	-	-	-	-	-	-
Liq. SpG	1.01	1.01	1.00	-	1.00	-	1.02	1.00	1.01	1.00	-	-
Radionuclides (Ci)												
^{241}Am	-	-	6.16E-07	6.16E-04	-	-	-	-	-	-	-	-
^{137}Cs	-	-	4.65E-07	4.65E-02	-	-	-	-	-	-	-	-
^{129}I	-	-	2.32E-09	2.32E-04	-	-	-	-	-	-	-	-
^{238}Pu	-	-	1.26E-09	1.26E-06	-	-	-	-	-	-	-	-
^{239}Pu	-	-	1.43E-07	1.43E-04	-	-	-	-	-	-	-	-
^{241}Pu	-	-	1.43E-08	1.42E-05	-	-	-	-	-	-	-	-
^{99}Tc	-	-	1.69E-07	1.69E-02	-	-	-	-	-	-	-	-
^{90}Sr	-	-	1.61E-07	1.61E-01	-	-	-	-	-	-	-	-
^{233}U	-	-	7.34E-11	7.33E-08	-	-	-	-	-	-	-	-
^{235}U	-	-	1.07E-07	1.07E-04	-	-	-	-	-	-	-	-
Total Activity	-	-	2.72E+01	7.77E-01	-	-	-	-	-	-	-	-
Chemical Components (kg)												
Aluminum	2.11E+05	-	6.50E-03	6.50E+00	-	-	-	-	-	-	-	-
Bismuth	-	-	1.71E-03	1.71E+00	-	-	-	-	-	-	-	-
Chlorine	-	-	6.57E-03	6.56E+00	-	-	-	-	-	-	-	-
Chromium	-	-	2.04E-04	2.03E-01	-	-	-	-	-	-	-	-
Fluorine	-	-	2.46E-03	2.46E+00	-	-	-	-	-	-	-	-
Iron	3.03E+05	-	5.74E-02	5.74E+01	-	-	-	-	-	-	-	-
Nickel	-	-	3.52E-04	3.51E-01	-	-	-	-	-	-	-	-
Nitrate	-	3.78E+03	4.46E-01	4.46E+02	-	-	9.97E+03	-	1.53E+04	-	-	-
Nitrite	-	-	1.31E-02	1.31E+01	1.77E+03	-	5.07E+02	-	1.16E+04	7.56E+01	-	-
Potassium	-	-	1.52E-03	1.52E+00	-	-	-	-	-	-	-	-
Phosphate	-	-	1.33E-01	1.33E+02	-	-	-	-	-	-	-	-
Sodium	2.44E+04	4.59E+04	7.19E-03	7.19E+00	1.65E+03	-	6.77E+04	-	1.26E+04	7.22E+01	-	-
Sulfate	-	-	1.59E-02	1.59E+01	-	-	-	-	-	-	-	-
TOC	-	-	2.45E+01	3.26E+02	-	-	-	-	-	-	-	-
Oxalate	-	-	3.41E+03	-	-	-	-	-	-	-	-	-
Zirconium	1.74E+05	-	4.81E-09	4.81E-06	-	-	-	-	-	-	-	-

3.5.4 Phase 4 – Waste Treatment and Immobilization Plant Full Operations

Table 3-6 provides a summary mass flow of major interfaces and constituents of interest for Phase 4. The information was taken from SVF-2931. The interface numbers match those depicted in Figure 2-1 and Figure 2-5.

Table 3-6. Phase 4 Summary Mass Flow

Interface Number	1a	2	3	4	5	6	7a	8a	9a	10a	13	15	16	17a	18a	19a	20a
Interface Name	T Complex CH-TRU	B Complex CH-TRU	CH-TRU Packaging Off-gas	Supp. TRU Treatment Facility	CH-TRU to WIPP	CH-TRU 2nd Liquid Waste	T Complex Waste	T Complex Waste from WRF	U Farm Waste	S Complex Waste	222-S Lab Waste	Cross Site Waste Transfer	MUST / IMUST Waste	B Complex Waste	B Complex Waste	C Farm Waste	A Complex Waste
Solids Volume (gal)	-	-	-	-	-	-	-	-	-	5.14E+04	-	5.86E+04	1.15E+04	-	-	-	7.35E+03
Liquid Volume (gal)	-	-	-	-	-	-	-	-	-	9.22E+05	2.00E+04	1.55E+06	2.09E+05	-	-	-	1.41E+06
Total Volume (gal)	-	-	-	-	-	-	-	-	-	9.74E+05	2.00E+04	1.61E+06	2.20E+05	-	-	-	1.42E+06
Wt% Solids (wt%)	-	-	-	-	-	-	-	-	-	13.78	-	8.47	14.11	-	-	-	1.35
Liq. SpG	-	-	-	-	-	-	-	-	-	1.05	1.01	1.28	1.01	-	-	-	1.14
Radionuclides (Ci)																	
^{241}Am	-	-	-	-	-	-	-	-	-	4.22E+02	6.93E-02	1.73E+04	6.43E-01	-	-	-	1.83E+02
^{137}Cs	-	-	-	-	-	-	-	-	-	5.27E+04	3.39E+00	5.94E+05	6.02E+03	-	-	-	1.30E+05
^{129}I	-	-	-	-	-	-	-	-	-	4.27E-02	1.65E-15	9.96E-01		-	-	-	4.74E-02
^{238}Pu	-	-	-	-	-	-	-	-	-	1.11E+01	1.61E-04	1.57E+02	1.29E+00	-	-	-	4.59E+00
^{239}Pu	-	-	-	-	-	-	-	-	-	5.00E+02	6.06E-03	4.03E+03	7.90E+02	-	-	-	1.85E+02
^{241}Pu	-	-	-	-	-	-	-	-	-	1.70E+02	2.54E-03	2.95E+03	1.22E+01	-	-	-	-
^{99}Tc	-	-	-	-	-	-	-	-	-	2.51E+01	1.39E-06	1.04E+03		-	-	-	2.59E+02
^{90}Sr	-	-	-	-	-	-	-	-	-	2.74E+05	2.06E+00	1.40E+05	1.57E+03	-	-	-	-
^{233}U	-	-	-	-	-	-	-	-	-	2.14E-01	-	2.83E+00		-	-	-	4.40E+00
^{235}U	-	-	-	-	-	-	-	-	-	1.27E-01	1.49E-05	9.40E-02	2.23E-04	-	-	-	3.18E-02
Total Activity	-	-	-	-	-	-	-	-	-	6.62E+05	3.12E+01	1.50E+06	1.57E+04	-	-	-	-
Chemical Components (kg)																	
Aluminum	-	-	-	-	-	-	-	-	-	1.64E+05	-	1.71E+05	1.93E+03	-	-	-	2.97E+04
Bismuth	-	-	-	-	-	-	-	-	-	6.37E+01	-	2.42E+03	1.62E+04	-	-	-	1.96E+02
Chlorine	-	-	-	-	-	-	-	-	-	3.13E+03	9.74E+01	2.94E+04	-	-	-	-	9.76E+03
Chromium	-	-	-	-	-	-	-	-	-	4.36E+03	-	2.98E+04	-	-	-	-	2.28E+03
Fluorine	-	-	-	-	-	-	-	-	-	1.48E+04	-	3.49E+03	1.03E+02	-	-	-	1.17E+03
Iron	-	-	-	-	-	-	-	-	-	2.74E+03	-	1.26E+04	5.72E+03	-	-	-	1.04E+03
Nickel	-	-	-	-	-	-	-	-	-	9.64E+02	-	3.70E+02	1.06E+04	-	-	-	2.01E+02
Nitrate	-	-	-	-	-	-	-	-	-	1.31E+05	7.25E+02	6.14E+05	3.85E+04	-	-	-	2.26E+05
Nitrite	-	-	-	-	-	-	-	-	-	4.20E+04	8.67E+01	3.81E+05	2.87E+03	-	-	-	1.62E+05
Potassium	-	-	-	-	-	-	-	-	-	7.60E+02	-	1.14E+04	-	-	-	-	5.17E+03
Phosphate	-	-	-	-	-	-	-	-	-	2.11E+04	-	5.11E+04	7.85E+03	-	-	-	1.20E+04
Sodium	-	-	-	-	-	-	-	-	-	1.38E+05	4.98E+02	8.73E+05	8.53E+03	-	-	-	3.92E+05
Sulfate	-	-	-	-	-	-	-	-	-	2.23E+03	-	2.19E+04	2.17E+03	-	-	-	2.98E+04
TOC	-	-	-	-	-	-	-	-	-	1.11E+03	-	1.90E+04	-	-	-	-	8.81E+03
Oxalate	-	-	-	-	-	-	-	-	-	6.36E+03	-	8.28E+04	-	-	-	-	2.19E+04
Zirconium	-	-	-	-	-	-	-	-	-	1.07E+04	-	1.62E+02	-	-	-	-	2.82E+02

Table 3-6. Phase 4 Summary Mass Flow (continued)

Interface Number	21	22a	22b	23	25	27a	27b	28	29	30a	31	32	33a	34a	35a	35b	36
Interface Name	Purex & T-Plant Waste	Evaporator Feed	Evaporator Bottoms	Evaporator Off-gas	Evaporator Secondary Liquid Waste	Waste to LAW PS	Solids and Cs Return from LAW PS	DFLAW	WTP DFLAW Secondary Liquid Waste	HLW to TWCS	DFHLW	WTP DFHLW Secondary Liquid Waste	LAW Feed to WTP PT	HLW Feed to WTP PT	HLW	HLW Secondary Liquid Waste	HLW Off-gas
Solids Volume (gal)	-	-	-	-	-	3.22E+01	2.05E+01	-	-	9.78E+04	-	-	-	1.06E+05	3.14E+04	1.63E+02	5.98E-10
Liquid Volume (gal)	-	6.54E+06	3.67E+06	3.49E+01	3.64E+06	7.20E+04	5.90E+04	-	-	2.60E+06	-	-	1.00E+06	2.81E+06	4.27E+05	5.64E+05	4.90E-07
Total Volume (gal)	-	6.54E+06	3.67E+06	3.49E+01	3.64E+06	7.20E+04	5.90E+04	-	-	2.70E+06	-	-	1.00E+06	2.92E+06	4.58E+05	5.64E+05	4.90E-07
Wt% Solids (wt%)	-	-	-	-	-	0.10	0.10	-	-	8.55	-	-	-	8.72	17.96	0.09	0.35
Liq. SpG	-	1.21	1.38	1.14	1.00	1.28	1.01	-	-	1.20	-	-	1.24	1.18	1.01	1.00	1.00
Radionuclides (Ci)																	
^{241}Am	-	2.18E+02	2.18E+02	7.63E-08	2.38E-04	7.26E-01	4.06E-01	-	-	1.08E+04	-	-	5.92E+00	2.61E+04	1.88E+04	3.59E+02	1.39E-11
^{137}Cs	-	1.24E+06	1.24E+06	5.72E-07	1.34E-02	-	-	-	-	1.36E+06	-	-	4.01E+05	1.26E+06	4.54E+05	9.14E+03	2.83E-07
^{129}I	-	1.86E+00	1.86E+00	6.61E-08	6.00E-05	4.23E-02	7.51E-06	-	-	1.01E+00	-	-	4.36E-01	1.01E+00	5.84E-02	3.63E-02	8.07E-06
^{238}Pu	-	1.35E+00	1.35E+00	2.59E-10	8.09E-07	-2.09E-02	-2.13E-03	-	-	1.88E+02	-	-	1.65E-01	2.91E+02	1.75E+02	2.16E+00	8.31E-14
^{239}Pu	-	3.62E+01	3.62E+01	7.57E-09	2.36E-05	5.22E-01	6.40E-02	-	-	3.35E+03	-	-	3.04E+00	3.72E+03	2.36E+03	2.95E+01	1.14E-12
^{241}Pu	-	1.73E+01	1.73E+01	3.45E-09	1.08E-05	-	-5.18E-01	-	-	1.63E+03	-	-	2.33E+00	2.62E+03	1.69E+03	2.11E+01	7.35E-13
^{99}Tc	-	2.34E+03	2.34E+03	5.01E-07	3.25E-04	3.70E+01		-	-	8.25E+02	-	-	4.34E+02	7.35E+02	2.94E-01	6.18E-01	1.08E-14
^{90}Sr	-	4.45E+03	4.45E+03	3.74E-06	4.37E-02	-	-	-	-	1.57E+06	-	-	1.63E+03	4.46E+06	3.21E+06	3.46E+04	1.07E-06
^{233}U	-	1.94E-02	1.94E-02	2.04E-11	1.32E-08	2.44E-03	4.01E-04	-	-	7.31E+01	-	-	2.75E-02	1.40E+01	3.89E+00	4.65E-02	1.82E-15
^{235}U	-	2.77E-03	2.77E-03	2.31E-12	1.50E-09	6.22E-05	1.02E-05	-	-	2.49E-01	-	-	7.09E-04	2.74E-01	1.99E-01	2.50E-03	9.65E-17
Total Activity	-	2.42E+06	2.42E+06	-3.93E-02	-	-	-	-	-	5.97E+06	-	-	7.84E+05	1.18E+07	7.60E+06	9.07E+04	8.27E-03
Chemical Components (kg)																	
Aluminum	-	4.67E+04	4.67E+04	2.43E-06	1.58E-03	1.37E+03	5.85E+01	-	-	2.99E+05	-	-	1.02E+04	2.81E+05	2.36E+04	1.87E+02	5.37E-10
Bismuth	-	7.20E+02	7.20E+02	4.00E-05	1.12E+00	5.03E+00		-	-	5.16E+03	-	-	1.31E+02	1.12E+04	7.10E+03	2.59E+01	9.96E-13
Chlorine	-	5.64E+04	5.64E+04	3.86E-05	2.97E-01	8.74E+02	-	-	-	1.72E+04	-	-	1.06E+04	1.38E+04	6.10E+00	1.03E+01	1.58E-03
Chromium	-	3.38E+03	3.38E+03	5.04E-07	2.68E-03	1.26E+02	1.46E-01	-	-	8.62E+03	-	-	1.10E+03	1.01E+04	8.29E+02	1.03E+01	3.94E-10
Fluorine	-	4.63E+04	4.63E+04	1.35E-03	2.54E+00	2.39E+02		-	-	1.28E+04	-	-	1.74E+03	9.13E+03	5.80E+00	4.11E+01	2.27E-04
Iron	-	1.15E+03	1.15E+03	3.47E-03	1.73E+00	1.07E+01	1.14E+00	-	-	7.06E+04	-	-	2.94E+02	1.49E+05	1.06E+05	1.02E+03	7.82E-10
Nickel	-	2.32E+00	2.32E+00	4.79E-06	3.10E-03	1.08E+00	2.54E-01	-	-	8.51E+03	-	-	1.48E+00	9.74E+03	6.73E+03	5.55E+01	8.24E-10
Nitrate	-	2.14E+06	2.14E+06	4.82E-07	6.78E-01	3.23E+04	1.65E+03	-	-	7.47E+05	-	-	3.40E+05	6.94E+05	8.40E+03	2.73E+02	-
Nitrite	-	1.05E+06	1.05E+06	1.42E-06	1.48E-02	1.37E+04	-	-	-	3.45E+05	-	-	1.66E+05	3.01E+05	3.32E+02	2.30E+01	-
Potassium	-	4.77E+04	4.77E+04	7.06E-05	4.49E-02	1.20E+03	-	-	-	3.15E+04	-	-	1.92E+04	3.00E+04	1.21E+02	4.23E+00	1.37E-10
Phosphate	-	6.25E+04	6.25E+04	6.16E-05	3.99E-02	1.19E+03	-	-	-	4.93E+04	-	-	1.36E+04	7.55E+04	3.92E+01	5.51E+00	1.30E-10
Sodium	-	2.57E+06	2.57E+06	1.20E-03	7.51E-01	3.55E+04	5.06E+02	-	-	9.21E+05	-	-	4.22E+05	8.54E+05	6.54E+03	7.24E+01	2.11E-10
Sulfate	-	1.78E+05	1.78E+05	6.30E-04	2.65E+00	1.76E+03	-	-	-	3.58E+04	-	-	2.47E+04	3.40E+04	1.57E+01	3.27E+01	-
TOC	-	1.78E+05	1.78E+05	-	5.43E+02	4.88E+02	-	-	-	1.68E+04	-	-	7.93E+03	1.42E+04	1.52E+01	-	-
Oxalate	-	2.70E+04	2.51E+04	2.97E-03	1.94E+03	3.26E+02	3.79E+01	-	-	3.56E+04	-	-	3.63E+03	4.36E+04	1.84E+02	-	-
Zirconium	-	-	-	-	-	3.46E-02	2.20E-02	-	-	1.40E+04	-	-	-	5.12E+03	3.70E+03	2.17E+01	1.72E-10

Table 3-6. Phase 4 Summary Mass Flow (continued)

Interface Number	37a	37b	38	39	40	41a	41b	42	43	45	46	47	48	49	50	51
Interface Name	HLW Secondary Solid Waste	LAW Secondary Solid Waste	IHLW	IHLW	IHLW	LAW	LAW Secondary Liquid Waste	LAW Off-gas	ILAW	WTP PT LAW to SLAW Immob.	LAW PS to SLAW Immob.	SLAW Immob. Off-gas	SLAW Immob. Secondary Liquid Waste	Supp. ILAW	WTP PT Off-gas	WTP PT Secondary Liquid Waste
Solids Volume (gal)	-	-	-	-	-	2.28E+02	6.95E-01	1.22E-09	-	-	-	-	-	-	-	1.23E+00
Liquid Volume (gal)	-	-	-	-	-	3.32E+06	3.60E+06	1.00E-03	-	-	-	-	-	-	3.05E+02	5.38E+06
Total Volume (gal)	-	-	-	-	-	3.32E+06	3.60E+06	1.00E-03	-	-	-	-	-	-	3.05E+02	5.38E+06
Wt% Solids (wt%)	-	-	-	-	-	0.02	0.00	0.00	-	-	-	-	-	-	-	0.00
Liq. SpG	-	-	-	-	-	1.35	1.01	1.03	-	-	-	-	-	-	1.04	1.00
Radionuclides (Ci)																
^{241}Am	1.30E+02	-2.61E-04	1.77E+04	1.77E+04	1.77E+04	6.10E+02	1.12E+01	7.93E-11	5.94E+02	-	-	-	-	-	1.56E-06	2.78E-03
^{137}Cs	5.68E+00	6.82E-01	4.17E+05	4.17E+05	4.17E+05	4.38E+02	1.07E+02	4.50E-07	2.85E+02	-	-	-	-	-	1.97E-07	2.66E-03
^{129}I	8.17E-03	1.35E-01	1.31E-02	1.31E-02	1.31E-02	1.82E+00	6.21E-01	1.36E-03	1.06E+00	-	-	-	-	-	2.88E-06	1.49E-03
^{238}Pu	1.29E+00	-7.78E-05	1.62E+02	1.62E+02	1.62E+02	2.59E+01	2.42E-01	1.72E-12	2.54E+01	-	-	-	-	-	3.06E-08	5.58E-05
^{239}Pu	1.86E+01	3.17E-05	2.24E+03	2.24E+03	2.24E+03	3.18E+02	2.98E+00	2.11E-11	3.13E+02	-	-	-	-	-	3.66E-07	6.64E-04
^{241}Pu	1.18E+01	-5.43E-03	1.44E+03	1.44E+03	1.44E+03	2.24E+02	2.10E+00	1.47E-11	2.17E+02	-	-	-	-	-	2.52E-07	4.61E-04
^{99}Tc	9.91E-04	3.16E-01	3.10E-01	3.10E-01	3.10E-01	2.48E+03	1.55E+03	1.89E-07	9.28E+02	-	-	-	-	-	3.73E-05	1.37E-02
^{90}Sr	2.40E+04	-9.88E-01	2.93E+06	2.93E+06	2.93E+06	8.44E+03	7.94E+01	6.38E-11	7.50E+03	-	-	-	-	-	5.31E-04	3.82E+00
^{233}U	3.25E-02	1.30E-08	3.52E+00	3.52E+00	3.52E+00	1.46E-01	1.30E-03	9.40E-15	1.38E-01	-	-	-	-	-	1.42E-09	4.15E-07
^{235}U	1.68E-03	4.50E-10	1.89E-01	1.89E-01	1.89E-01	4.06E-03	3.81E-05	2.70E-16	4.01E-03	-	-	-	-	-	3.19E-11	1.15E-08
Total Activity	5.03E+04	-2.37E-01	6.93E+06	6.93E+06	6.93E+06	2.18E+04	2.05E+03	2.70E+01	1.78E+04	-	-	-	-	-	3.18E-03	9.00E+00
Chemical Components (kg)																
Aluminum	2.12E+02	8.65E-01	2.37E+04	2.37E+04	2.37E+04	2.28E+05	4.34E+02	5.19E-07	4.98E+05	-	-	-	-	-	8.29E-05	3.02E-02
Bismuth	6.96E+01	7.88E-04	6.86E+03	6.86E+03	6.86E+03	2.14E+03	3.93E+01	4.73E-10	2.09E+03	-	-	-	-	-	8.12E-04	1.29E+01
Chlorine	1.60E+00	2.53E+03	4.15E+00	4.15E+00	4.15E+00	3.61E+04	1.56E+04	2.34E-01	1.79E+04	-	-	-	-	-	1.22E-03	2.86E+01
Chromium	6.99E+00	1.26E+01	7.86E+02	7.86E+02	7.86E+02	9.18E+03	6.39E+02	7.58E-06	8.47E+03	-	-	-	-	-	2.76E-05	8.42E-02
Fluorine	2.37E-01	1.45E+03	8.01E+00	8.01E+00	8.01E+00	1.73E+04	7.72E+03	4.12E-01	8.07E+03	-	-	-	-	-	2.73E-02	6.12E+01
Iron	8.54E+02	5.06E-03	1.01E+05	1.01E+05	1.01E+05	2.66E+03	4.88E+00	3.04E-09	5.98E+05	-	-	-	-	-	4.73E-02	1.35E+01
Nickel	5.70E+01	1.86E-04	6.41E+03	6.41E+03	6.41E+03	7.91E+01	7.41E-01	1.11E-10	7.79E+01	-	-	-	-	-	1.07E-03	3.90E-01
Nitrate	-	-	-	-	-	1.03E+06	4.68E+04	-	-	-	-	-	-	-	2.94E-06	3.20E+03
Nitrite	-	-	-	-	-	4.14E+05	1.44E+03	-	-	-	-	-	-	-	3.75E-06	2.19E-02
Potassium	1.10E-01	1.41E+01	1.26E+02	1.26E+02	1.26E+02	4.49E+04	2.23E+03	8.45E-06	4.26E+04	-	-	-	-	-	7.26E-04	2.60E-01
Phosphate	2.16E-04	6.67E+01	-	-	-	8.28E+04	9.18E+02	4.00E-05		-	-	-	-	-	5.66E-04	2.05E-01
Sodium	1.15E+03	1.28E+02	1.24E+05	1.24E+05	1.24E+05	2.25E+06	5.17E+04	7.69E-05	2.21E+06	-	-	-	-	-	1.21E-02	6.34E+03
Sulfate	-	-	-	-	-	5.19E+04	4.86E+02	-	-	-	-	-	-	-	1.17E-03	2.57E+01
TOC	-	-	-	-	-	1.93E+04	-	-	-	-	-	-	-	-	2.14E+01	1.93E+02
Oxalate	-	-	-	-	-	3.99E+04	-	-	-	-	-	-	-	-	1.82E+02	1.52E+03
Zirconium	2.86E+01	9.51E-16	3.55E+03	3.55E+03	3.55E+03	1.31E-13	1.31E-13	5.70E-22	3.42E+05	-	-	-	-	-		

Table 3-6. Phase 4 Summary Mass Flow (continued)

Interface Number	60a	61a	62a	64	65	66	69	70	72	73	74	76	79
Interface Name	WTP PT Utilities	WTP LAW Utilities	WTP HLW Utilities	LERF/ETF Wastewater	LERF/ETF Solid Waste	SST Utilities	WRF Utilities	DST-Utilities	242-A Utilities - Process Water	LAW PS Utilities	TWCS Utilities	SLAW Immob. Utilities	SLAW Immob. Solid Waste
Solids Volume (gal)	1.23E+00	-	-	7.50E-02	1.62E+03	-	-	-	-	-	-	-	-
Liquid Volume (gal)	1.82E+06	1.55E+06	2.73E+05	7.54E+06	-	1.96E+06	-	3.57E+06	7.74E+05	1.40E+04	3.78E+04	-	-
Total Volume (gal)	1.82E+06	1.55E+06	2.73E+05	7.54E+06	1.62E+03	1.96E+06	-	3.57E+06	7.74E+05	1.40E+04	3.78E+04	-	-
Wt% Solids (wt%)	0.00	-	-	0.00	-	-	-	-	-	-	-	-	-
Liq. SpG	1.30	1.01	1.00	1.00	-	1.00	-	1.01	1.00	1.01	1.00	-	-
Radionuclides (Ci)													
^{241}Am	-	-	-	1.49E-06	1.49E-03	-	-	-	-	-	-	-	-
^{137}Cs	-	-	-	2.15E-07	2.15E-02	-	-	-	-	-	-	-	-
^{129}I	-	-	-	9.34E-09	9.34E-04	-	-	-	-	-	-	-	-
^{238}Pu	-	-	-	2.39E-08	2.39E-05	-	-	-	-	-	-	-	-
^{239}Pu	-	-	-	3.48E-07	3.48E-04	-	-	-	-	-	-	-	-
^{241}Pu	-	-	-	2.26E-07	2.26E-04	-	-	-	-	-	-	-	-
^{99}Tc	-	-	-	7.37E-08	7.37E-03	-	-	-	-	-	-	-	-
^{90}Sr	-	-	-	2.29E-06	2.29E+00	-	-	-	-	-	-	-	-
^{233}U	-	-	-	1.27E-10	1.27E-07	-	-	-	-	-	-	-	-
^{235}U	-	-	-	1.34E-08	1.34E-05	-	-	-	-	-	-	-	-
Total Activity	-	-	-	-	4.94E+00	-	-	-	-	-	-	-	-
Chemical Components (kg)													
Aluminum	-	2.71E+05	-	1.11E-02	1.11E+01	-	-	-	-	-	-	-	-
Bismuth	-	-	-	6.82E-03	6.81E+00	-	-	-	-	-	-	-	-
Chlorine	-	-	-	1.15E-02	1.14E+01	-	-	-	-	-	-	-	-
Chromium	-	-	-	7.01E-05	7.00E-02	-	-	-	-	-	-	-	-
Fluorine	-	-	-	2.99E-02	2.99E+01	-	-	-	-	-	-	-	-
Iron	-	5.96E+05	-	1.69E-02	1.69E+01	-	-	-	-	-	-	-	-
Nickel	-	-	-	1.93E-04	1.93E-01	-	-	-	-	-	-	-	-
Nitrate	1.22E+05	-	-	1.26E+00	1.26E+03	-	-	1.04E+04	-	4.13E+02	-	-	-
Nitrite	3.66E+02	-	-	2.15E-03	2.15E+00	-	-	6.23E+02	-	-	7.24E+01	-	-
Potassium	-	-	-	2.50E-04	2.50E-01	-	-	-	-	-	-	-	-
Phosphate	-	-	-	7.53E-02	7.53E+01	-	-	-	-	-	-	-	-
Sodium	1.19E+06	2.28E+04	1.24E+05	2.20E+00	2.20E+03	-	-	5.42E+04	-	1.21E+02	6.91E+01	-	-
Sulfate	-	-	-	2.62E-02	2.61E+01	-	-	-	-	-	-	-	-
TOC	-	-	-	3.85E+01	5.12E+02	-	-	-	-	-	-	-	-
Oxalate	-	-	-	5.40E+03	-	-	-	-	-	-	-	-	-
Zirconium	-	3.43E+05	-	8.55E-09	8.54E-06	-	-	-	-	-	-	-	-

3.5.5 Phase 5 – Balance of Mission

Table 3-7 provides a summary mass flow of major interfaces and constituents of interest for Phase 5. The information was taken from SVF-2931. The interface numbers match those depicted in Figure 2-1 and Figure 2-6.

Table 3-7. Phase 5 Summary Mass Flow

Interface Number	1a	2	3	4	5	6	7a	8a	9a	10a	13	15	16	17a	18a	19a	20a
Interface Name	T Complex CH-TRU	B Complex CH-TRU	CH-TRU Packaging Off-gas	Supp. TRU Treatment Facility	CH-TRU to WIPP	CH-TRU 2nd Liquid Waste	T Complex Waste	T Complex Waste from WRF	U Farm Waste	S Complex Waste	222-S Lab Waste	Cross Site Waste Transfer	MUST / IMUST Waste	B Complex Waste	B Complex Waste	C Farm Waste	A Complex Waste
Solids Volume (gal)	-	-	-	-	-	-	2.14E+06	9.91E+05	1.69E+05	7.86E+05	-	1.08E+06	1.73E+04	9.25E+05	8.29E+05	-	-
Liquid Volume (gal)	-	-	-	-	-	-	3.20E+07	3.47E+07	1.34E+07	2.64E+07	1.70E+05	7.75E+07	3.13E+05	3.16E+07	3.37E+07	-	-
Total Volume (gal)	-	-	-	-	-	-	3.42E+07	3.57E+07	1.35E+07	2.71E+07	1.70E+05	7.85E+07	3.30E+05	3.25E+07	3.45E+07	-	-
Wt% Solids (wt%)	-	-	-	-	-	-	15.96	7.07	3.22	7.13	-	3.47	14.11	7.20	6.11	-	-
Liq. SpG	-	-	-	-	-	-	1.06	1.13	1.14	1.17	1.01	1.17	1.01	1.13	1.13	-	-
Radionuclides (Ci)																	
^{241}Am	-	-	-	-	-	-	1.07E+04	1.07E+04	2.18E+03	8.25E+03	5.57E-01	2.56E+04	1.61E+00	2.54E+03	2.54E+03	-	-
^{137}Cs	-	-	-	-	-	-	7.39E+05	7.39E+05	6.02E+05	1.21E+06	7.89E+00	2.47E+06	2.06E+03	7.91E+05	7.91E+05	-	-
^{129}I	-	-	-	-	-	-	2.81E+00	2.81E+00	1.61E+00	3.72E+00	1.40E-14	8.60E+00		2.80E+00	2.80E+00	-	-
^{238}Pu	-	-	-	-	-	-	1.84E+02	1.84E+02	3.26E+01	1.31E+02	1.00E-03	3.69E+02	1.32E+00	4.68E+01	4.68E+01	-	-
^{239}Pu	-	-	-	-	-	-	8.21E+03	8.21E+03	1.71E+03	6.55E+03	5.15E-02	1.80E+04	1.18E+03	2.61E+03	2.61E+03	-	-
^{241}Pu	-	-	-	-	-	-	1.05E+03	1.05E+03	1.67E+02	3.96E+02	-1.05E-02	-	-	2.86E+02	2.86E+02	-	-
^{99}Tc	-	-	-	-	-	-	2.73E+03	2.73E+03	1.66E+03	3.64E+03	1.18E-05	8.56E+03		2.11E+03	2.11E+03	-	-
^{90}Sr	-	-	-	-	-	-	2.69E+05	2.69E+05	1.85E+05	3.77E+06	4.28E+00	4.48E+06	4.78E+02	7.06E+05	7.06E+05	-	-
^{233}U	-	-	-	-	-	-	3.34E+01	3.34E+01	3.53E+00	6.62E+00		4.52E+01		1.25E+02	1.25E+02	-	-
^{235}U	-	-	-	-	-	-	1.62E+00	1.62E+00	5.49E-01	1.01E+00	1.27E-04	3.33E+00	3.35E-04	2.61E+00	2.61E+00	-	-
Total Activity	-	-	-	-	-	-	2.17E+06	2.17E+06	1.61E+06	1.04E+07	1.98E+02	1.45E+07	6.17E+03	3.25E+06	3.25E+06	-	-
Chemical Components (kg)																	
Aluminum	-	-	-	-	-	-	9.11E+05	9.11E+05	6.40E+05	2.41E+06	-	4.22E+06	2.90E+03	1.17E+06	1.17E+06	-	-
Bismuth	-	-	-	-	-	-	1.30E+05	1.30E+05	1.65E+04	2.18E+03	-	1.49E+05	2.44E+04	1.67E+05	1.67E+05	-	-
Chlorine	-	-	-	-	-	-	1.10E+05	1.10E+05	6.09E+04	1.57E+05	8.28E+02	3.46E+05	-	6.83E+04	6.83E+04	-	-
Chromium	-	-	-	-	-	-	6.03E+04	6.03E+04	4.41E+04	1.93E+05	-	3.33E+05	-	1.05E+05	1.05E+05	-	-
Fluorine	-	-	-	-	-	-	1.92E+05	1.92E+05	2.27E+04	5.20E+04	-	2.83E+05	1.55E+02	4.28E+05	4.28E+05	-	-
Iron	-	-	-	-	-	-	2.20E+05	2.20E+05	3.41E+04	7.02E+04	-	3.32E+05	8.58E+03	2.62E+05	2.62E+05	-	-
Nickel	-	-	-	-	-	-	7.81E+03	7.81E+03	1.35E+03	5.22E+03	-	1.59E+04	1.60E+04	2.59E+04	2.59E+04	-	-
Nitrate	-	-	-	-	-	-	1.41E+07	1.41E+07	4.23E+06	1.28E+07	6.16E+03	3.15E+07	5.77E+04	9.02E+06	9.02E+06	-	-
Nitrite	-	-	-	-	-	-	1.83E+06	1.83E+06	9.13E+05	2.39E+06	7.37E+02	5.35E+06	4.31E+03	1.93E+06	1.94E+06	-	-
Potassium	-	-	-	-	-	-	4.78E+04	4.78E+04	2.36E+04	4.08E+04	-	1.18E+05	-	7.77E+04	7.77E+04	-	-
Phosphate	-	-	-	-	-	-	1.61E+06	1.61E+06	3.37E+05	3.46E+05	-	2.35E+06	1.18E+04	1.68E+06	1.68E+06	-	-
Sodium	-	-	-	-	-	-	9.04E+06	9.04E+06	3.26E+06	8.59E+06	4.24E+03	2.15E+07	1.28E+04	9.25E+06	9.25E+06	-	-
Sulfate	-	-	-	-	-	-	1.06E+06	1.06E+06	1.85E+05	3.42E+05	-	1.60E+06	3.26E+03	1.13E+06	1.13E+06	-	-
TOC	-	-	-	-	-	-	9.39E+04	9.39E+04	1.04E+05	4.56E+04	-	2.58E+05	-	6.28E+04	6.28E+04	-	-
Oxalate	-	-	-	-	-	-	1.01E+05	1.01E+05	8.47E+04	2.11E+05	-	5.55E+05	-	4.65E+05	4.65E+05	-	-
Zirconium	-	-	-	-	-	-	1.50E+03	1.50E+03	3.18E+02	2.18E+04	-	3.44E+04	-	1.95E+03	1.95E+03	-	-

Table 3-7. Phase 5 Summary Mass Flow (continued)

Interface Number	21	22a	22b	23	25	27a	27b	28	29	30a	31	32	33a	34a	35a	35b	36
Interface Name	Purex & T-Plant Waste	Evaporator Feed	Evaporator Bottoms	Evaporator Off-gas	Evaporator Secondary Liquid Waste	Waste to LAW PS	Solids and Cs Return from LAW PS	DFLAW	WTP DFLAW Secondary Liquid Waste	HLW to TWCS	DFHLW	WTP DFHLW Secondary Liquid Waste	LAW Feed to WTP PT	HLW Feed to WTP PT	HLW	HLW Secondary Liquid Waste	HLW Off-gas
Solids Volume (gal)	4.08E+01	-	-	-	-	7.64E+03	7.81E+03	-	-	2.42E+06	-	-	-	2.50E+06	9.68E+05	6.12E+03	2.77E-08
Liquid Volume (gal)	3.00E+04	9.83E+07	4.90E+07	7.92E+00	6.26E+07	1.83E+07	4.22E+06	-	-	7.29E+07	-	-	3.81E+07	7.74E+07	1.45E+07	1.82E+07	1.37E-05
Total Volume (gal)	3.00E+04	9.83E+07	4.90E+07	7.92E+00	6.26E+07	1.83E+07	4.22E+06	-	-	7.54E+07	-	-	3.81E+07	7.99E+07	1.55E+07	1.82E+07	1.38E-05
Wt% Solids (wt%)	0.37	-	-	-	-	0.10	0.55	-	-	7.86	-	-	-	7.71	16.45	0.10	0.60
Liq. SpG	1.11	1.19	1.37	4.08	1.00	1.23	1.01	-	-	1.16	-	-	1.24	1.16	1.02	1.00	1.00
Radionuclides (Ci)																	
^{241}Am	6.59E-05	5.00E+02	5.00E+02	2.09E-07	6.10E-04	6.12E+02	2.44E+02	-	-	8.66E+04	-	-	4.98E+02	9.84E+04	1.05E+05	2.06E+03	7.92E-11
^{137}Cs	-	-	-	8.68E-07	1.99E-02	1.19E+06	1.26E+06	-	-	5.61E+06	-	-	4.58E+06	6.88E+06	1.29E+07	2.74E+05	8.44E-06
^{129}I	-	1.20E+01	1.20E+01	5.68E-07	5.15E-04	4.33E+00	7.95E-03	-	-	1.25E+01	-	-	7.79E+00	1.34E+01	2.15E+00	1.35E+00	3.04E-04
^{238}Pu	2.45E-05	3.40E+00	3.40E+00	6.32E-10	1.97E-06	1.75E+00	4.10E-02	-	-	1.17E+03	-	-	2.72E+00	1.35E+03	1.33E+03	1.71E+01	6.52E-13
^{239}Pu	1.05E-03	9.83E+01	9.83E+01	1.71E-08	5.33E-05	5.02E+01	2.74E+00	-	-	3.89E+04	-	-	5.46E+01	4.23E+04	3.97E+04	5.10E+02	1.97E-11
^{241}Pu	2.42E-04	-	-	-1.03E-08	-3.22E-05	-	-	-	-	2.02E+03	-	-	1.14E+01	5.27E+03	5.58E+03	7.22E+01	2.18E-12
^{99}Tc	-	1.24E+04	1.24E+04	3.30E-06	2.14E-03	4.32E+03	-	-	-	1.04E+04	-	-	8.34E+03	1.11E+04	3.07E+00	1.92E+00	7.43E-14
^{90}Sr	1.03E+00	-	-	-1.64E-05	-1.92E-01	1.18E+04	1.45E+04	-	-	5.44E+06	-	-	3.53E+03	8.53E+06	9.86E+06	1.11E+05	3.12E-06
^{233}U	-	3.44E-01	3.44E-01	4.10E-10	2.64E-07	4.23E-01	2.24E-01	-	-	5.79E+02	-	-	2.07E-01	6.43E+02	6.53E+02	8.38E+00	3.25E-13
^{235}U	-	6.69E-03	6.69E-03	8.14E-12	5.21E-09	1.11E-02	6.02E-03	-	-	8.31E+00	-	-	5.21E-03	8.58E+00	8.63E+00	1.11E-01	4.29E-15
Total Activity	2.07E+00	-	-	-9.24E-01	-	2.38E+06	2.52E+06	-	-	2.37E+07	-	-	8.93E+06	3.26E+07	4.69E+07	7.83E+05	2.33E-01
Chemical Components (kg)																	
Aluminum	-	2.96E+05	2.96E+05	1.89E-05	1.22E-02	2.03E+05	8.44E+03	-	-	7.09E+06	-	-	2.19E+05	7.36E+06	2.48E+06	1.91E+04	5.70E-08
Bismuth	-	2.32E+04	2.32E+04	1.54E-03	4.30E+01	3.91E+03	8.59E-02	-	-	3.61E+05	-	-	9.97E+03	3.67E+05	3.23E+05	1.20E+03	4.63E-11
Chlorine	2.01E+01	4.48E+05	4.48E+05	3.67E-04	2.82E+00	1.25E+05		-	-	3.49E+05	-	-	2.59E+05	3.64E+05	9.90E+01	5.51E+01	1.78E-02
Chromium	-	1.59E+05	1.59E+05	3.04E-05	1.61E-01	3.28E+04	1.70E+02	-	-	4.24E+05	-	-	6.86E+04	4.31E+05	5.81E+04	7.45E+02	2.84E-08
Fluorine	3.24E+00	7.42E+05	7.42E+05	3.44E-02	6.49E+01	1.17E+05	2.02E+02	-	-	9.04E+05	-	-	1.86E+05	9.16E+05	1.02E+03	8.10E+02	1.44E-02
Iron	-	8.90E+03	8.90E+03	3.21E-02	1.60E+01	2.04E+03	8.26E+01	-	-	8.36E+05	-	-	3.86E+03	9.10E+05	8.99E+05	8.93E+03	6.83E-09
Nickel	-	2.29E+01	2.29E+01	5.88E-05	3.80E-02	2.22E+02	1.46E+02	-	-	9.75E+04	-	-	3.93E+01	1.06E+05	1.07E+05	9.12E+02	1.35E-08
Nitrate	3.52E+03	4.07E+07	4.07E+07	1.26E-05	1.17E+01	7.96E+06	1.18E+05	-	-	2.22E+07	-	-	2.05E+07	2.28E+07	6.50E+05	1.86E+04	-
Nitrite	2.61E+03	8.03E+06	8.03E+06	1.41E-05	1.47E-01	2.34E+06	-	-	-	5.73E+06	-	-	4.31E+06	6.03E+06	8.36E+03	1.27E+03	-
Potassium	-	3.02E+05	3.02E+05	5.55E-04	3.51E-01	1.41E+05	-	-	-	3.80E+05	-	-	2.15E+05	4.06E+05	5.94E+03	1.86E+02	6.79E-09
Phosphate	2.70E+03	2.76E+06	2.76E+06	3.99E-03	2.58E+00	5.21E+05	1.84E+03	-	-	2.95E+06	-	-	1.15E+06	3.00E+06	6.75E+02	7.11E+00	6.03E-10
Sodium	-	3.13E+07	3.13E+07	1.94E-02	1.21E+01	7.50E+06	6.19E+04	-	-	2.25E+07	-	-	1.55E+07	2.33E+07	4.28E+05	4.24E+03	1.38E-08
Sulfate	2.73E+02	3.33E+06	3.33E+06	1.58E-02	6.66E+01	4.83E+05	8.68E+01	-	-	2.00E+06	-	-	1.04E+06	2.03E+06	4.54E+02	2.25E+02	-
TOC	5.68E+01	3.89E+05	3.89E+05	-	1.74E+03	1.09E+05	-	-	-	3.86E+05	-	-	2.69E+05	4.00E+05	4.66E+02	-	-
Oxalate	-	6.79E+05	6.31E+05	7.47E-02	4.88E+04	1.81E+05	3.53E+04	-	-	1.22E+06	-	-	1.80E+05	1.25E+06	3.36E+04	-	-
Zirconium	-	-	-	-	-	1.39E+01	1.39E+01	-	-	3.78E+05	-	-	-	3.92E+05	3.95E+05	2.37E+03	1.88E-08

Table 3-7. Phase 5 Summary Mass Flow (continued)

Interface Number	37a	37b	38	39	40	41a	41b	42	43	45	46	47	48	49	50	51	60a
Interface Name	HLW Secondary Solid Waste	LAW Secondary Solid Waste	IHLW	IHLW	IHLW	LAW	LAW Secondary Liquid Waste	LAW Off-gas	ILAW	WTP PT LAW to SLAW Immob.	LAW PS to SLAW Immob.	SLAW Immob. Off-gas	SLAW Immob. Secondary Liquid Waste	Supp. ILAW	WTP PT Off-gas	WTP PT Secondary Liquid Waste	WTP PT Utilities
Solids Volume (gal)	-	-	-	-	-	1.11E+04	3.08E+01	6.21E-08	-	1.63E+04	192.50	-	1.23E-07	-	-	3.53E+01	3.53E+01
Liquid Volume (gal)	-	-	-	-	-	3.84E+07	4.19E+07	1.40E-02	-	6.07E+07	1.85E+07	7.44E+03	8.35E+07	-	6.10E+03	1.18E+08	4.21E+07
Total Volume (gal)	-	-	-	-	-	3.84E+07	4.19E+07	1.40E-02	-	6.07E+07	1.85E+07	7.44E+03	8.35E+07	-	6.10E+03	1.18E+08	4.21E+07
Wt% Solids (wt%)	-	-	-	-	-	0.06	0.00	0.00	-	0.06	0.00	-	0.00	-	-	0.00	0.00
Liq. SpG	-	-	-	-	-	1.35	1.01	1.04	-	1.34	1.23	1.00	1.00	-	1.04	1.00	1.28
Radionuclides (Ci)																	
^{241}Am	3.51E+02	1.31E+00	1.02E+05	1.02E+05	1.02E+05	1.09E+03	2.01E+01	1.39E-10	1.05E+03	1.78E+03	3.99E+02	8.67E-07	2.71E-03	2.17E+03	4.44E-06	7.01E-03	-
^{137}Cs	4.55E+04	1.20E+00	1.25E+07	1.25E+07	1.25E+07	1.08E+03	2.62E+02	5.69E-07	3.60E+02	1.91E+03	2.84E+04	3.25E-07	7.65E-03	3.03E+04	3.92E-06	5.00E-02	-
^{129}I	3.05E-01	6.95E-01	4.94E-01	4.94E-01	4.94E-01	9.26E+00	3.17E+00	6.97E-03	5.40E+00	1.45E+01	4.48E+00	2.16E-02	1.69E-02	1.67E+01	1.25E-05	6.40E-03	-
^{238}Pu	4.00E+00	6.02E-02	1.29E+03	1.29E+03	1.29E+03	4.92E+01	4.65E-01	3.24E-12	4.81E+01	7.96E+01	2.57E+00	6.92E-09	2.16E-05	8.20E+01	8.67E-08	1.40E-04	-
^{239}Pu	1.28E+02	1.96E+00	3.91E+04	3.91E+04	3.91E+04	1.69E+03	1.60E+01	1.13E-10	1.68E+03	2.39E+03	4.95E+01	2.03E-07	6.34E-04	2.44E+03	2.85E-06	4.71E-03	-
^{241}Pu	1.29E+01	2.53E-01	4.34E+03	4.34E+03	4.34E+03	9.53E+01	9.14E-01	4.60E-12	6.82E+01	3.85E+02	1.24E+01	3.32E-08	1.04E-04	3.97E+02	2.63E-07	3.86E-04	-
^{99}Tc	2.96E-03	5.16E+00	1.15E+00	1.15E+00	1.15E+00	1.04E+04	6.53E+03	8.00E-07	3.92E+03	1.58E+04	4.46E+03	2.77E-04	1.80E-01	1.99E+04	1.11E-04	4.06E-02	-
^{90}Sr	2.00E+04	2.50E+01	8.67E+06	8.67E+06	8.67E+06	6.15E+03	5.85E+01	-1.67E-11	-	2.13E+04	6.07E+03	6.72E-06	7.86E-02	2.74E+04	1.72E-03	1.05E+01	-
^{233}U	1.85E+00	3.25E-03	6.43E+02	6.43E+02	6.43E+02	2.90E+00	2.74E-02	1.94E-13	2.87E+00	4.10E+00	2.06E-01	2.72E-09	1.76E-06	4.30E+00	3.66E-08	1.15E-05	-
^{235}U	2.56E-02	4.34E-05	8.50E+00	8.50E+00	8.50E+00	3.73E-02	3.52E-04	2.49E-15	3.70E-02	5.50E-02	5.26E-03	3.69E-11	2.39E-08	6.02E-02	5.07E-10	1.61E-07	-
Total Activity	1.36E+05	6.38E+01	4.39E+07	4.39E+07	4.39E+07	3.01E+04	7.21E+03	2.18E+02	5.42E+03	7.05E+04	7.28E+04	1.04E+02	5.64E+02	1.42E+05	3.54E-02	4.02E+01	-
Chemical Components (kg)																	
Aluminum	6.97E+03	6.92E+03	2.45E+06	2.45E+06	2.45E+06	2.14E+06	4.11E+03	4.90E-06	6.41E+06	2.99E+06	1.99E+05	2.06E-05	1.34E-02	1.46E+07	1.22E-03	4.07E-01	-
Bismuth	9.05E+02	2.55E+01	3.21E+05	3.21E+05	3.21E+05	2.28E+04	4.21E+02	5.06E-09	2.23E+04	3.40E+04	3.93E+03	1.99E-03	5.55E+01	3.78E+04	1.37E-02	2.10E+02	-
Chlorine	1.78E+01	2.06E+04	2.62E+01	2.62E+01	2.62E+01	2.90E+05	1.26E+05	1.89E+00	1.44E+05	4.62E+05	1.28E+05	6.72E+00	7.69E+02	5.13E+05	7.10E-03	2.19E+02	-
Chromium	1.84E+02	4.69E+02	5.71E+04	5.71E+04	5.71E+04	1.84E+05	1.29E+04	1.53E-04	1.71E+05	2.71E+05	3.31E+04	2.11E-04	1.12E+00	3.03E+05	8.87E-04	2.58E+00	-
Fluorine	1.50E+01	4.71E+04	1.97E+02	1.97E+02	1.97E+02	5.57E+05	2.49E+05	1.33E+01	2.61E+05	7.92E+05	1.17E+05	3.91E+01	4.79E+03	7.45E+05	6.23E-01	1.71E+03	-
Iron	3.58E+03	8.25E+03	1.31E+06	1.31E+06	1.31E+06	2.53E+04	4.67E+01	2.90E-08	7.68E+06	3.56E+04	2.00E+03	1.13E-02	5.62E+00	1.75E+07	7.93E-01	2.10E+02	-
Nickel	3.00E+02	9.18E-01	1.06E+05	1.06E+05	1.06E+05	8.44E+02	7.96E+00	1.19E-09	8.36E+02	1.21E+03	7.91E+01	1.17E-03	7.61E-01	1.28E+03	1.46E-02	4.92E+00	-
Nitrate	-	-	-	-	-	1.72E+07	5.94E+05	-	-	2.88E+07	8.08E+06	1.79E-05	9.82E+04	-	6.15E-05	4.38E+04	2.78E+06
Nitrite	-	-	-	-	-	3.94E+06	1.75E+03	-	-	6.58E+06	2.39E+06	2.16E-07	2.24E-03	-	6.15E-05	3.52E-01	8.08E+03
Potassium	1.99E+01	2.73E+02	5.74E+03	5.74E+03	5.74E+03	2.38E+05	1.18E+04	4.48E-05	2.26E+05	3.96E+05	1.45E+05	2.58E-03	1.64E+00	5.40E+05	4.82E-03	1.57E+00	-
Phosphate	1.01E-03	1.34E+03	-	-	-	1.66E+06	1.84E+04	8.05E-04		2.51E+06	5.23E+05	2.04E-03	1.33E+00	-	2.03E-02	7.44E+00	-
Sodium	4.75E+03	2.93E+04	1.73E+06	1.73E+06	1.73E+06	2.55E+07	6.89E+05	8.76E-04	2.52E+07	3.91E+07	7.62E+06	5.05E-02	1.82E+05	4.76E+07	2.07E-01	8.34E+04	2.55E+07
Sulfate	-	-	-	-	-	1.34E+06	3.12E+05	-	-	2.04E+06	4.89E+05	1.29E-01	1.27E+04	-	9.88E-02	4.60E+03	-
TOC	-	-	-	-	-	2.38E+05	-	-	-	4.28E+05	1.11E+05	-	-	-	5.04E+02	4.43E+03	-
Oxalate	-	-	-	-	-	5.27E+05	-	-	-	8.15E+05	1.46E+05	-	-	-	6.13E+03	5.01E+04	-
Zirconium	7.58E+02	4.72E+03	3.92E+05	3.92E+05	3.92E+05	3.99E-27	-	-	4.39E+06	1.72E-27	7.60E-07	-	2.31E-18	1.00E+07	-	-	-

Table 3-7. Phase 5 Summary Mass Flow (continued)

Interface Number	61a	62a	64	65	66	69	70	72	73	74	76	79
Interface Name	WTP LAW Utilities	WTP HLW Utilities	LERF/ETF Wastewater	LERF/ETF Solid Waste	SST Utilities	WRF Utilities	DST-Utilities	242-A Utilities - Process Water	LAW PS Utilities	TWCS Utilities	SLAW Immob. Utilities	SLAW Immob. Solid Waste
Solids Volume (gal)	-	-	3.50E-02	1.11E+05	-	-	-	-	-	-	-	-
Liquid Volume (gal)	2.02E+07	7.32E+06	2.63E+08	-	9.73E+07	3.87E+06	4.16E+07	1.33E+07	4.22E+06	1.17E+06	1.73E+07	-
Total Volume (gal)	2.02E+07	7.32E+06	2.63E+08	1.11E+05	9.73E+07	3.87E+06	4.16E+07	1.33E+07	4.22E+06	1.17E+06	1.73E+07	-
Wt% Solids (wt%)	-	-	0.00	-	-	-	-	-	-	-	-	-
Liq. SpG	1.01	1.00	1.00	-	1.01	1.00	1.01	1.00	1.01	1.00	1.03	-
Radionuclides (Ci)												
^{241}Am	-	-	1.21E-05	1.21E-02	-	-	-	-	-	-	-	2.74E+00
^{137}Cs	-	-	8.89E-07	8.89E-02	-	-	-	-	-	-	-	8.31E+01
^{129}I	-	-	2.44E-07	2.44E-02	-	-	-	-	-	-	-	2.15E+00
^{238}Pu	-	-	1.94E-07	1.94E-04	-	-	-	-	-	-	-	1.11E-01
^{239}Pu	-	-	5.72E-06	5.72E-03	-	-	-	-	-	-	-	3.46E+00
^{241}Pu	-	-	6.86E-07	6.85E-04	-	-	-	-	-	-	-	5.30E-01
^{99}Tc	-	-	2.29E-06	2.29E-01	-	-	-	-	-	-	-	2.79E+01
^{90}Sr	-	-	1.19E-05	1.19E+01	-	-	-	-	-	-	-	1.53E+01
^{233}U	-	-	1.38E-08	1.38E-05	-	-	-	-	-	-	-	5.79E-03
^{235}U	-	-	4.05E-09	4.05E-06	-	-	-	-	-	-	-	7.79E-05
Total Activity	-	-	-	5.92E+02	-	-	-	-	-	-	-	2.34E+02
Chemical Components (kg)												
Aluminum	4.28E+06	-	1.01E-03	1.01E+00	-	-	-	-	-	-	1.14E+07	1.84E+04
Bismuth	-	-	3.10E-01	3.10E+02	-	-	-	-	-	-	-	5.31E+01
Chlorine	-	-	1.00E+00	1.00E+03	-	-	-	-	-	-	-	7.31E+04
Chromium	-	-	3.84E-03	3.84E+00	-	-	-	-	-	-	-	8.43E+02
Fluorine	-	-	6.36E+00	6.35E+03	-	-	-	-	-	-	-	1.35E+05
Iron	7.66E+06	4.16E+05	2.35E-01	2.35E+02	-	-	-	-	-	-	1.75E+07	2.21E+04
Nickel	-	-	5.74E-03	5.73E+00	-	-	-	-	-	-	-	1.75E+00
Nitrate	-	-	1.43E+02	1.43E+05	-	-	8.40E+03	-	1.18E+05	-	-	-
Nitrite	-	-	1.01E-03	1.01E+00	2.51E+06	6.95E+03	6.20E+03	-	-	1.98E+03	-	-
Potassium	-	-	3.75E-03	3.74E+00	-	-	-	-	-	-	-	8.04E+02
Phosphate	-	-	1.79E-02	1.79E+01	-	-	-	-	-	-	-	2.48E+03
Sodium	3.62E+05	1.31E+06	2.66E+02	2.66E+05	1.42E+06	6.63E+03	6.87E+05	-	4.33E+04	1.89E+03	1.16E+06	6.48E+04
Sulfate	-	-	1.66E+01	1.66E+04	-	-	-	-	-	-	-	-
TOC	-	-	4.46E+02	5.93E+03	-	-	-	-	-	-	-	9.51E-03
Oxalate	-	-	9.90E+04	-	-	-	-	-	-	-	-	-
Zirconium	4.40E+06	-	4.36E-10	4.36E-07	-	-	-	-	-	-	1.00E+07	1.26E+04

3.5.6 River Protection Project Overview

Table 3-8 provides a summary mass flow of major interfaces and constituents of interest for the entire RPP Mission. The information was taken from SVF-2931. The interface numbers match those depicted in Figure 2-1.

Table 3-8. RPP Mission Summary Mass Flow

IFP Number	1a	2	3	4	5	6	7a	8a	9a	10a	13	15	16	17a	18a	19a	20a
IFP Name	T Complex CH-TRU	B Complex CH-TRU	CH-TRU Packaging Off-gas	Supp. TRU Treatment Facility	CH-TRU to WIPP	CH-TRU 2nd Liquid Waste	T Complex Waste	T Complex Waste from WRF	U Farm Waste	S Complex Waste	222-S Lab Waste	Cross Site Waste Transfer	MUST / IMUST Waste	B Complex Waste	B Complex Waste	C Farm Waste	A Complex Waste
Solids Volume (gal)	1.29E+05	1.48E+04	1.18E-01	1.44E+05	1.44E+05	1.24E+02	2.14E+06	9.91E+05	1.69E+05	8.53E+05	-	1.14E+06	2.89E+04	9.25E+05	8.29E+05	1.67E+05	8.49E+04
Liquid Volume (gal)	2.46E+06	2.45E+06	-	5.80E+04	5.80E+04	4.38E+06	3.20E+07	3.47E+07	1.34E+07	2.76E+07	2.90E+05	7.95E+07	5.21E+05	3.16E+07	3.37E+07	1.63E+06	8.04E+06
Total Volume (gal)	2.59E+06	2.47E+06	1.17E-01	2.02E+05	2.02E+05	4.38E+06	3.42E+07	3.57E+07	1.35E+07	2.85E+07	2.90E+05	8.07E+07	5.50E+05	3.25E+07	3.45E+07	1.80E+06	8.13E+06
Wt% Solids (wt%)	13.58	1.78	-	87.24	87.24	0.01	15.96	7.07	3.22	7.39	-	3.55	14.11	7.2	6.11	22.67	2.79
Liq. SpG	1.00	1.00	-	1.09	1.09	1.00	1.06	1.13	1.14	1.16	1.01	1.17	1.01	1.13	1.13	1.04	1.10
Radionuclides (Ci)																	
^{241}Am	1.42E+02	2.68E+01	4.61E-08	1.68E+02	1.68E+02	1.17E-04	1.07E+04	1.07E+04	2.18E+03	8.70E+03	9.79E-01	4.28E+04	2.26E+00	2.54E+03	2.54E+03	2.00E+03	8.94E+03
^{137}Cs	1.45E+02	1.08E+01	8.34E-11	1.55E+02	1.55E+02	1.55E-06	7.39E+05	7.39E+05	6.02E+05	1.28E+06	3.45E+01	3.09E+06	8.08E+03	7.91E+05	7.91E+05	4.74E+04	4.48E+05
^{129}I	5.11E-04	7.88E-10	1.67E-07	3.74E-04	3.74E-04	1.33E-04	2.81E+00	2.81E+00	1.61E+00	3.79E+00	2.39E-14	9.68E+00		2.80E+00	2.80E+00	4.32E-01	7.54E-01
^{238}Pu	3.53E+00	1.28E+00	5.81E-10	4.80E+00	4.80E+00	1.44E-06	1.84E+02	1.84E+02	3.26E+01	1.43E+02	2.05E-03	5.26E+02	2.61E+00	4.68E+01	4.68E+01	6.66E+01	8.11E+01
^{239}Pu	7.02E+02	2.11E+02	1.10E-07	9.13E+02	9.13E+02	2.73E-04	8.21E+03	8.21E+03	1.71E+03	7.07E+03	8.79E-02	2.21E+04	1.97E+03	2.61E+03	2.61E+03	4.17E+03	2.89E+03
^{241}Pu	1.45E+01	2.90E+00	2.10E-09	1.73E+01	1.73E+01	5.19E-06	1.05E+03	1.05E+03	1.67E+02	5.71E+02	2.03E-02	2.80E+03	8.29E+00	2.86E+02	2.86E+02	5.10E+02	4.30E+02
^{99}Tc	1.70E+01	6.58E-01	3.42E-05	1.77E+01	1.77E+01	1.77E-02	2.73E+03	2.73E+03	1.66E+03	3.68E+03	2.02E-05	9.62E+03		2.11E+03	2.11E+03	9.55E+01	1.10E+03
^{90}Sr	3.33E+03	1.84E+02	1.66E-06	3.51E+03	3.51E+03	1.54E-02	2.69E+05	2.69E+05	1.85E+05	4.06E+06	2.07E+01	4.62E+06	2.05E+03	7.06E+05	7.06E+05	2.89E+05	2.05E+06
^{233}U	3.00E-06	2.22E-08	5.84E-12	3.01E-06	3.01E-06	3.02E-09	3.34E+01	3.34E+01	3.53E+00	6.94E+00	-	4.81E+01		1.25E+02	1.25E+02	1.15E+02	1.82E+01
^{235}U	1.25E-01	9.53E-04	2.43E-07	1.25E-01	1.25E-01	1.25E-04	1.62E+00	1.62E+00	5.49E-01	1.17E+00	2.16E-04	3.43E+00	5.58E-04	2.61E+00	2.61E+00	4.21E-01	1.64E-01
Total Activity	8.01E+03	6.54E+02	7.69E-05	8.65E+03	8.65E+03	1.06E-01	2.17E+06	2.17E+06	1.61E+06	1.11E+07	4.06E+02	1.61E+07	2.18E+04	3.25E+06	3.25E+06	6.91E+05	5.37E+06
Chemical Components (kg)																	
Aluminum	2.74E+04	3.88E+02	3.57E-02	2.76E+04	2.76E+04	1.84E+01	9.11E+05	9.11E+05	6.40E+05	2.59E+06	-	4.40E+06	4.83E+03	1.17E+06	1.17E+06	4.45E+05	1.64E+05
Bismuth	1.35E+05	3.63E+04	2.68E-09	1.71E+05	1.71E+05	2.14E-02	1.30E+05	1.30E+05	1.65E+04	2.25E+03	-	1.52E+05	4.06E+04	1.67E+05	1.67E+05	6.84E+03	4.52E+02
Chlorine	4.10E+03	6.60E+02	1.47E-03	4.74E+03	4.74E+03	9.14E+00	1.10E+05	1.10E+05	6.09E+04	1.61E+05	1.41E+03	3.77E+05	-	6.83E+04	6.83E+04	2.50E+03	3.51E+04
Chromium	8.79E+03	2.21E+03	7.31E-05	1.10E+04	1.10E+04	3.15E-01	6.03E+04	6.03E+04	4.41E+04	1.98E+05	-	3.63E+05	-	1.05E+05	1.05E+05	1.26E+03	2.02E+04
Fluorine	2.72E+04	4.66E+03	4.21E-04	3.18E+04	3.18E+04	1.33E+00	1.92E+05	1.92E+05	2.27E+04	6.72E+04	-	2.88E+05	2.58E+02	4.28E+05	4.28E+05	7.20E+03	4.52E+03
Iron	6.90E+04	4.57E+03	1.42E-01	7.34E+04	7.34E+04	7.35E+01	2.20E+05	2.20E+05	3.41E+04	7.32E+04	-	3.44E+05	1.43E+04	2.62E+05	2.62E+05	3.68E+04	7.74E+04
Nickel	4.21E+02	1.77E+02	1.16E-03	5.97E+02	5.97E+02	5.98E-01	7.81E+03	7.81E+03	1.35E+03	6.19E+03	-	1.62E+04	2.66E+04	2.59E+04	2.59E+04	1.15E+04	5.79E+03
Nitrate	3.34E+05	3.87E+04	7.92E-02	3.72E+05	3.72E+05	6.54E+02	1.41E+07	1.41E+07	4.23E+06	1.30E+07	1.05E+04	3.22E+07	9.62E+04	9.02E+06	9.02E+06	1.04E+05	9.89E+05
Nitrite	3.86E+04	5.87E+03	2.19E-03	4.45E+04	4.45E+04	1.86E+01	1.83E+06	1.83E+06	9.13E+05	2.44E+06	1.26E+03	5.75E+06	7.18E+03	1.93E+06	1.94E+06	4.09E+04	5.99E+05
Potassium	6.31E+03	3.73E+03	5.56E-03	1.00E+04	1.00E+04	2.87E+00	4.78E+04	4.78E+04	2.36E+04	4.18E+04	-	1.30E+05	-	7.77E+04	7.77E+04	2.28E+03	2.25E+04
Phosphate	2.17E+05	6.34E+03	4.32E-01	2.23E+05	2.23E+05	2.23E+02	1.61E+06	1.61E+06	3.37E+05	3.78E+05	-	2.42E+06	1.96E+04	1.68E+06	1.68E+06	4.96E+04	7.98E+04
Sodium	2.73E+05	2.60E+04	1.92E-02	2.98E+05	2.98E+05	9.95E+00	9.04E+06	9.04E+06	3.26E+06	8.77E+06	7.23E+03	2.25E+07	2.13E+04	9.25E+06	9.25E+06	2.85E+05	1.68E+06
Sulfate	2.34E+04	3.69E+02	2.99E-03	2.37E+04	2.37E+04	1.70E+01	1.06E+06	1.06E+06	1.85E+05	3.46E+05	-	1.63E+06	5.43E+03	1.13E+06	1.13E+06	1.37E+04	1.58E+05
TOC	5.89E+03	2.32E+02	3.39E-01	5.95E+03	5.95E+03	1.75E+02	9.39E+04	9.39E+04	1.04E+05	4.71E+04	-	2.77E+05	-	6.28E+04	6.28E+04	5.84E+03	2.99E+04
Oxalate	1.22E+04	2.49E+03	2.29E-10	1.47E+04	1.47E+04	1.83E-03	1.01E+05	1.01E+05	8.47E+04	2.21E+05	-	6.42E+05	-	4.65E+05	4.65E+05	2.79E+03	2.82E+05
Zirconium	1.12E+02	3.73E+00	1.80E-12	1.15E+02	1.15E+02	1.43E-05	1.50E+03	1.50E+03	3.18E+02	3.25E+04	-	3.45E+04	-	1.95E+03	1.95E+03	5.30E+03	2.49E+03

Table 3-7. RPP Mission Summary Mass Flow (continued)

IFP Number	21	22a	22b	23	25	27a	27b	28	29	30a	31	32	33a	34a	35a	35b	36
IFP Name	Purex & T-Plant Waste	Evaporator Feed	Evaporator Bottoms	Evaporator Off-gas	Evaporator Secondary Liquid Waste	Waste to LAW PS	Solids and Cs Return from LAW PS	DFLAW	WTP DFLAW Secondary Liquid Waste	HLW to TWCS	DFHLW	WTP DFHLW Secondary Liquid Waste	LAW Feed to WTP PT	HLW Feed to WTP PT	HLW	HLW Secondary Liquid Waste	HLW Off-gas
Solids Volume (gal)	4.08E+01	-	-	-	-	1.10E+04	1.12E+04	1.33E+00	7.00E-03	2.65E+06	3.63E+04	2.36E+02	-	2.61E+06	1.00E+06	6.28E+03	2.92E-08
Liquid Volume (gal)	3.00E+04	1.44E+08	7.43E+07	4.08E+02	8.85E+07	2.60E+07	5.98E+06	7.49E+06	7.80E+06	7.87E+07	1.14E+06	1.59E+06	3.91E+07	8.02E+07	1.49E+07	1.88E+07	3.42E-05
Total Volume (gal)	3.00E+04	1.44E+08	7.43E+07	4.08E+02	8.85E+07	2.61E+07	5.99E+06	7.49E+06	7.80E+06	8.13E+07	1.18E+06	1.59E+06	3.91E+07	8.28E+07	1.59E+07	1.88E+07	3.42E-05
Wt% Solids (wt%)	0.37	-	-	-	-	0.10	0.55	0.00	0.00	7.99	8.55	0.04	-	7.74	16.49	0.10	0.26
Liq. SpG	1.11	1.19	1.37	1.20	1.00	1.25	1.01	1.28	1.01	1.17	1.02	1.01	1.24	1.16	1.02	1.00	1.00
Radionuclides (Ci)																	
^{241}Am	6.59E-05	3.41E+03	3.41E+03	1.31E-06	4.09E-03	1.25E+03	2.88E+02	5.60E+02	1.03E+01	1.41E+05	1.67E+04	3.25E+02	5.04E+02	1.25E+05	1.23E+05	2.42E+03	1.06E-10
^{137}Cs	-	1.87E+07	1.87E+07	9.50E-06	2.22E-01	5.74E+06	5.71E+06	7.02E+02	1.68E+02	8.18E+06	3.42E+04	7.00E+02	4.98E+06	8.14E+06	1.33E+07	2.84E+05	8.76E-06
^{129}I	-	2.97E+01	2.97E+01	1.26E-06	1.14E-03	8.03E+00	8.75E-03	3.54E+00	1.20E+00	1.45E+01	7.60E-02	4.62E-02	8.23E+00	1.44E+01	2.20E+00	1.38E+00	3.22E-04
^{238}Pu	2.45E-05	1.37E+01	1.37E+01	2.07E-09	6.46E-06	6.03E+00	5.40E-01	2.92E+00	2.72E-02	1.74E+03	9.43E+01	1.20E+00	2.89E+00	1.64E+03	1.50E+03	1.93E+01	7.94E-13
^{239}Pu	1.05E-03	2.65E+02	2.65E+02	4.54E-08	1.42E-04	1.10E+02	1.11E+01	4.94E+01	4.62E-01	4.77E+04	1.75E+03	2.21E+01	5.76E+01	4.60E+04	4.20E+04	5.40E+02	2.17E-11
^{241}Pu	2.42E-04	5.92E+01	5.92E+01	9.12E-09	2.85E-05	2.49E+01	2.26E+00	1.03E+01	9.58E-02	8.35E+03	4.61E+02	5.87E+00	1.37E+01	7.89E+03	7.27E+03	9.33E+01	3.84E-12
^{99}Tc	-	3.35E+04	3.35E+04	7.94E-06	5.15E-03	7.95E+03		3.49E+03	2.16E+03	1.19E+04	3.36E+01	2.04E+01	8.77E+03	1.19E+04	3.36E+00	2.54E+00	8.94E-13
^{90}Sr	1.03E+00	3.82E+04	3.82E+04	2.61E-05	3.05E-01	4.77E+04	3.27E+04	8.93E+03	8.37E+01	1.43E+07	1.29E+06	1.42E+04	5.17E+03	1.30E+07	1.31E+07	1.45E+05	5.12E-06
^{233}U	-	1.52E+00	1.52E+00	1.63E-09	1.06E-06	6.93E-01	2.70E-01	2.17E-01	2.03E-03	6.58E+02	7.82E-01	9.61E-03	2.34E-01	6.57E+02	6.57E+02	8.43E+00	3.27E-13
^{235}U	-	4.01E-02	4.01E-02	3.90E-11	2.53E-08	1.97E-02	7.35E-03	7.04E-03	6.61E-05	8.98E+00	1.28E-01	1.60E-03	5.92E-03	8.85E+00	8.83E+00	1.13E-01	4.45E-15
Total Activity	2.07E+00	3.65E+07	3.65E+07	9.61E-01	7.75E+01	1.13E+07	1.12E+07	2.37E+04	2.68E+03	4.71E+07	2.79E+06	3.17E+04	9.71E+06	4.43E+07	5.45E+07	8.74E+05	5.78E-01
Chemical Components (kg)																	
Aluminum	-	6.92E+05	6.92E+05	3.69E-05	2.39E-02	3.36E+05	1.74E+04	1.20E+05	2.27E+02	7.72E+06	8.00E+04	5.99E+02	2.29E+05	7.65E+06	2.50E+06	1.92E+04	5.94E-08
Bismuth	-	2.73E+04	2.73E+04	1.76E-03	4.92E+01	4.48E+03	8.59E-02	5.55E+02	1.02E+01	3.81E+05	2.93E+03	1.02E+01	1.01E+04	3.78E+05	3.30E+05	1.22E+03	4.77E-11
Chlorine	2.01E+01	8.58E+05	8.58E+05	6.50E-04	5.00E+00	2.07E+05	-	7.87E+04	3.37E+04	3.78E+05	4.71E+02	2.52E+02	2.70E+05	3.78E+05	1.05E+02	6.55E+01	1.03E-01
Chromium	-	2.16E+05	2.16E+05	3.84E-05	2.04E-01	4.58E+04	1.86E+02	1.25E+04	8.70E+02	4.42E+05	1.07E+03	1.35E+01	6.97E+04	4.41E+05	5.89E+04	7.55E+02	2.94E-08
Fluorine	3.24E+00	9.01E+05	9.01E+05	3.94E-02	7.44E+01	1.44E+05	2.79E+02	2.63E+04	1.17E+04	9.26E+05	1.09E+03	8.13E+02	1.88E+05	9.25E+05	1.03E+03	8.51E+02	2.98E-02
Iron	-	1.41E+04	1.41E+04	4.85E-02	2.42E+01	4.26E+03	3.18E+02	1.94E+03	3.57E+00	1.13E+06	6.80E+04	6.63E+02	4.15E+03	1.06E+06	1.00E+06	9.95E+03	8.13E-09
Nickel	-	1.29E+02	1.29E+02	1.96E-04	1.27E-01	3.32E+02	1.82E+02	7.07E+01	6.61E-01	1.19E+05	3.70E+03	3.05E+01	4.08E+01	1.16E+05	1.14E+05	9.67E+02	1.48E-08
Nitrate	3.52E+03	5.46E+07	5.46E+07	1.58E-05	1.65E+01	1.13E+07	1.68E+05	3.19E+06	1.40E+05	2.36E+07	2.26E+04	4.36E+03	2.08E+07	2.35E+07	6.59E+05	1.89E+04	-
Nitrite	2.61E+03	1.43E+07	1.43E+07	2.25E-05	2.34E-01	3.72E+06	-	1.33E+06	2.74E+04	6.34E+06	1.33E+04	3.12E+03	4.48E+06	6.33E+06	8.69E+03	1.29E+03	-
Potassium	-	9.32E+05	9.32E+05	1.43E-03	9.12E-01	2.78E+05	-	1.33E+05	6.54E+03	4.37E+05	1.30E+03	3.98E+01	2.35E+05	4.36E+05	6.06E+03	1.90E+02	8.41E-09
Phosphate	2.70E+03	3.33E+06	3.33E+06	4.58E-03	2.97E+00	6.43E+05	1.84E+03	1.17E+05	1.29E+03	3.09E+06	1.08E+04	1.07E+02	1.17E+06	3.08E+06	7.14E+02	1.26E+01	1.02E-08
Sodium	-	4.76E+07	4.76E+07	2.70E-02	1.68E+01	1.13E+07	8.02E+04	3.70E+06	1.42E+05	2.42E+07	3.78E+04	1.38E+04	1.59E+07	2.42E+07	4.35E+05	4.31E+03	1.52E-08
Sulfate	2.73E+02	4.32E+06	4.32E+06	1.93E-02	8.12E+01	7.07E+05	4.79E+02	2.17E+05	5.48E+04	2.06E+06	2.26E+03	1.09E+03	1.07E+06	2.06E+06	4.70E+02	2.58E+02	-
TOC	5.68E+01	7.93E+05	7.93E+05		3.11E+03	1.68E+05	-	5.75E+04	-	4.15E+05	6.03E+02	-	2.77E+05	4.15E+05	4.81E+02	-	-
Oxalate	-	9.48E+05	8.80E+05	1.04E-01	6.81E+04	2.18E+05	4.20E+04	2.99E+04	-	1.29E+06	2.29E+03	-	1.83E+05	1.29E+06	3.38E+04	-	-
Zirconium	-	-	-	-	-	1.51E+01	1.51E+01	5.95E-08	1.25E-11	4.00E+05	3.12E+03	1.84E+01	-	3.97E+05	3.99E+05	2.39E+03	1.91E-08

Table 3-7. RPP Mission Summary Mass Flow (continued)

IFP Number	37a	37b	38	39	40	41a	41b	42	43	45	46	47	48	49	50	51	60a
IFP Name	HLW Secondary Solid Waste	LAW Secondary Solid Waste	IHLW	IHLW	IHLW	LAW	LAW Secondary Liquid Waste	LAW Off-gas	ILAW	WTP PT LAW to SLAW Immob.	LAW PS to SLAW Immob.	SLAW Immob. Off-gas	SLAW Immob. Secondary Liquid Waste	Supp. ILAW	WTP PT Off-gas	WTP PT Secondary Liquid Waste	WTP PT Utilities
Solids Volume (gal)	-	-	-	-	-	1.13E+04	3.15E+01	6.33E-08	-	1.63E+04	192.50		1.23E-07	-	-	3.66E+01	3.66E+01
Liquid Volume (gal)	-	-	-	-	-	4.17E+07	4.55E+07	1.80E-02	-	6.07E+07	1.85E+07	7.44E+03	8.35E+07	-	6.40E+03	1.23E+08	4.39E+07
Total Volume (gal)	-	-	-	-	-	4.17E+07	4.55E+07	1.80E-02	-	6.07E+07	1.85E+07	7.44E+03	8.35E+07	-	6.40E+03	1.23E+08	4.39E+07
Wt% Solids (wt%)	-	-	-	-	-	0.06	0.00	0.00	-	0.06	0.00		0.00	-	-	0.00	0.00
Liq. SpG	-	-	-	-	-	1.35	1.01	1.03	-	1.34	1.23	1.00	1.00	-	1.04	1.00	1.28
Radionuclides (Ci)																	
^{241}Am	4.81E+02	1.49E+00	1.37E+05	1.37E+05	1.37E+05	1.70E+03	3.13E+01	2.95E-10	2.21E+03	1.78E+03	3.99E+02	8.67E-07	2.71E-03	2.17E+03	6.00E-06	9.79E-03	-
^{137}Cs	4.55E+04	6.10E+00	1.30E+07	1.30E+07	1.30E+07	1.52E+03	3.68E+02	2.65E-06	1.68E+03	1.91E+03	2.84E+04	3.25E-07	7.65E-03	3.03E+04	4.12E-06	5.27E-02	-
^{129}I	3.24E-01	1.10E+00	5.24E-01	5.24E-01	5.24E-01	1.11E+01	3.79E+00	1.10E-02	8.52E+00	1.45E+01	4.48E+00	2.16E-02	1.69E-02	1.67E+01	1.54E-05	7.89E-03	-
^{238}Pu	5.29E+00	6.53E-02	1.57E+03	1.57E+03	1.57E+03	7.50E+01	7.08E-01	5.20E-12	7.72E+01	7.96E+01	2.57E+00	6.92E-09	2.16E-05	8.20E+01	1.17E-07	1.96E-04	-
^{239}Pu	1.47E+02	2.02E+00	4.31E+04	4.31E+04	4.31E+04	2.01E+03	1.90E+01	1.38E-10	2.04E+03	2.39E+03	4.95E+01	2.03E-07	6.34E-04	2.44E+03	3.21E-06	5.37E-03	-
^{241}Pu	2.47E+01	3.06E-01	7.61E+03	7.61E+03	7.61E+03	3.20E+02	3.01E+00	2.20E-11	3.26E+02	3.85E+02	1.24E+01	3.32E-08	1.04E-04	3.97E+02	5.14E-07	8.46E-04	-
^{99}Tc	3.95E-03	7.87E+00	1.38E+01	1.38E+01	1.38E+01	1.29E+04	8.08E+03	1.26E-06	6.15E+03	1.58E+04	4.46E+03	2.77E-04	1.80E-01	1.99E+04	1.48E-04	5.43E-02	-
^{90}Sr	4.40E+04	4.50E+01	1.42E+07	1.42E+07	1.42E+07	1.46E+04	1.38E+02	1.98E-10	2.33E+04	2.13E+04	6.07E+03	6.72E-06	7.86E-02	2.74E+04	2.25E-03	1.43E+01	-
^{233}U	1.88E+00	3.55E-03	6.48E+02	6.48E+02	6.48E+02	3.04E+00	2.87E-02	2.18E-13	3.23E+00	4.10E+00	2.06E-01	2.72E-09	1.76E-06	4.30E+00	3.80E-08	1.19E-05	-
^{235}U	2.73E-02	5.15E-05	8.81E+00	8.81E+00	8.81E+00	4.14E-02	3.90E-04	3.23E-15	4.79E-02	5.50E-02	5.26E-03	3.69E-11	2.39E-08	6.02E-02	5.39E-10	1.73E-07	-
Total Activity	1.86E+05	1.17E+02	5.62E+07	5.62E+07	5.62E+07	5.19E+04	9.26E+03	2.95E+02	6.32E+04	7.05E+04	7.28E+04	1.04E+02	5.64E+02	1.42E+05	3.86E-02	4.92E+01	-
Chemical Components (kg)																	
Aluminum	7.18E+03	8.06E+03	2.55E+06	2.55E+06	2.55E+06	2.37E+06	4.54E+03	5.69E-06	7.79E+06	2.99E+06	1.99E+05	2.06E-05	1.34E-02	1.46E+07	1.31E-03	4.37E-01	-
Bismuth	9.74E+02	2.62E+01	3.31E+05	3.31E+05	3.31E+05	2.49E+04	4.61E+02	5.66E-09	2.50E+04	3.40E+04	3.93E+03	1.99E-03	5.55E+01	3.78E+04	1.45E-02	2.23E+02	-
Chlorine	1.03E+02	2.87E+04	1.52E+02	1.52E+02	1.52E+02	3.26E+05	1.41E+05	2.63E+00	2.01E+05	4.62E+05	1.28E+05	6.72E+00	7.69E+02	5.13E+05	8.32E-03	2.47E+02	-
Chromium	1.91E+02	5.16E+02	5.90E+04	5.90E+04	5.90E+04	1.94E+05	1.35E+04	1.71E-04	1.91E+05	2.71E+05	3.31E+04	2.11E-04	1.12E+00	3.03E+05	9.15E-04	2.66E+00	-
Fluorine	3.04E+01	5.08E+04	4.09E+02	4.09E+02	4.09E+02	5.75E+05	2.57E+05	1.44E+01	2.81E+05	7.92E+05	1.17E+05	3.91E+01	4.79E+03	7.45E+05	6.50E-01	1.77E+03	-
Iron	4.44E+03	9.63E+03	1.47E+06	1.47E+06	1.47E+06	2.79E+04	5.16E+01	3.43E-08	9.34E+06	3.56E+04	2.00E+03	1.13E-02	5.62E+00	1.75E+07	8.40E-01	2.23E+02	-
Nickel	3.57E+02	1.02E+00	1.16E+05	1.16E+05	1.16E+05	9.23E+02	8.70E+00	1.41E-09	9.83E+02	1.21E+03	7.91E+01	1.17E-03	7.61E-01	1.28E+03	1.57E-02	5.31E+00	-
Nitrate	-	-	-	-	-	1.83E+07	6.41E+05	-	-	2.88E+07	8.08E+06	1.79E-05	9.82E+04	-	6.44E-05	4.70E+04	2.91E+06
Nitrite	-	-	-	-	-	4.36E+06	3.19E+03	-	-	6.58E+06	2.39E+06	2.16E-07	2.24E-03	-	6.52E-05	3.74E-01	8.44E+03
Potassium	2.00E+01	4.85E+02	7.11E+03	7.11E+03	7.11E+03	2.82E+05	1.40E+04	7.83E-05	3.94E+05	3.96E+05	1.45E+05	2.58E-03	1.64E+00	5.40E+05	5.55E-03	1.83E+00	-
Phosphate	1.71E-02	1.50E+03	-	-	-	1.75E+06	1.94E+04	9.02E-04	-	2.51E+06	5.23E+05	2.04E-03	1.33E+00	-	2.09E-02	7.65E+00	-
Sodium	5.90E+03	3.48E+04	1.92E+06	1.92E+06	1.92E+06	2.78E+07	7.40E+05	1.08E-03	3.10E+07	3.91E+07	7.62E+06	5.05E-02	1.82E+05	4.76E+07	2.19E-01	8.97E+04	2.66E+07
Sulfate	-	-	-	-	-	1.39E+06	3.12E+05	-	-	2.04E+06	4.89E+05	1.29E-01	1.27E+04	-	9.99E-02	4.63E+03	-
TOC	-	-	-	-	-	2.58E+05	-	-	-	4.28E+05	1.11E+05	-	-	-	5.25E+02	4.63E+03	-
Oxalate	-	-	-	-	-	5.67E+05	-	-	-	8.15E+05	1.46E+05	-	-	-	6.31E+03	5.16E+04	-
Zirconium	7.86E+02	5.51E+03	3.99E+05	3.99E+05	3.99E+05	1.31E-13	1.31E-13	1.81E-19	5.34E+06	1.72E-27	7.60E-07	-	2.31E-18	1.00E+07	-	-	-

Table 3-7. RPP Mission Summary Mass Flow (continued)

IFP Number	61a	62a	64	65	66	69	70	72	73	74	76	79
IFP Name	WTP LAW Utilities	WTP HLW Utilities	LERF/ETF Wastewater	LERF/ETF Solid Waste	SST Utilities	WRF Utilities	DST-Utilities	242-A Utilities - Process Water	LAW PS Utilities	TWCS Utilities	SLAW Immob. Utilities	SLAW Immob. Solid Waste
Solids Volume (gal)	-	-	1.19E+00	1.15E+05	-	-	-	-	-	-	-	-
Liquid Volume (gal)	2.48E+07	8.25E+06	2.95E+08	-	1.11E+08	3.87E+06	5.11E+07	1.88E+07	6.01E+06	1.26E+06	1.73E+07	-
Total Volume (gal)	2.48E+07	8.25E+06	2.95E+08	1.15E+05	1.11E+08	3.87E+06	5.11E+07	1.88E+07	6.01E+06	1.26E+06	1.73E+07	-
Wt% Solids (wt%)	-	-	0.00	-	-	-	-	-	-	-	-	-
Liq. SpG	1.010	1.00	1.00	-	1.01	1.00	1.01	1.00	1.01	1.00	1.03	-
Radionuclides (Ci)												
^{241}Am	-	-	1.67E-05	1.67E-02	-	-	-	-	-	-	-	2.74E+00
^{137}Cs	-	-	2.82E-06	2.82E-01	-	-	-	-	-	-	-	8.31E+01
^{129}I	-	-	2.59E-07	2.59E-02	-	-	-	-	-	-	-	2.15E+00
^{238}Pu	-	-	2.23E-07	2.23E-04	-	-	-	-	-	-	-	1.11E-01
^{239}Pu	-	-	6.36E-06	6.35E-03	-	-	-	-	-	-	-	3.46E+00
^{241}Pu	-	-	9.74E-07	9.73E-04	-	-	-	-	-	-	-	5.30E-01
^{99}Tc	-	-	2.55E-06	2.55E-01	-	-	-	-	-	-	-	2.79E+01
^{90}Sr	-	-	1.46E-05	1.46E+01	-	-	-	-	-	-	-	1.53E+01
^{233}U	-	-	1.47E-08	1.46E-05	-	-	-	-	-	-	-	5.79E-03
^{235}U	-	-	1.26E-07	1.26E-04	-	-	-	-	-	-	-	7.79E-05
Total Activity	-	-	7.24E+01	6.07E+02	-	-	-	-	-	-	-	2.34E+02
Chemical Components (kg)												
Aluminum	5.32E+06	-	1.88E-02	1.88E+01	-	-	-	-	-	-	1.14E+07	1.84E+04
Bismuth	-	-	3.22E-01	3.21E+02	-	-	-	-	-	-	-	5.31E+01
Chlorine	-	-	1.02E+00	1.02E+03	-	-	-	-	-	-	-	7.31E+04
Chromium	-	-	4.23E-03	4.22E+00	-	-	-	-	-	-	-	8.43E+02
Fluorine	-	-	6.40E+00	6.39E+03	-	-	-	-	-	-	-	1.35E+05
Iron	9.32E+06	4.16E+05	3.20E-01	3.20E+02	-	-	-	-	-	-	1.75E+07	2.21E+04
Nickel	-	-	6.59E-03	6.58E+00	-	-	-	-	-	-	-	1.75E+00
Nitrate	-	3.78E+03	1.45E+02	1.45E+05	-	-	2.87E+04	-	1.68E+05		-	-
Nitrite	-	-	1.92E-02	1.92E+01	2.53E+06	6.95E+03	7.98E+03	-	2.95E+04	2.14E+03	-	-
Potassium	-	-	7.24E-03	7.23E+00	-	-	-	-	-	-	-	8.04E+02
Phosphate	-	-	2.34E-01	2.34E+02	-	-	-	-	-	-	-	2.48E+03
Sodium	4.61E+05	1.48E+06	2.68E+02	2.68E+05	1.63E+06	6.63E+03	1.01E+06	-	7.97E+04	2.04E+03	1.16E+06	6.48E+04
Sulfate	-	-	1.67E+01	1.67E+04	-	-	-	-	-	-	-	-
TOC	-	-	5.49E+02	7.30E+03	-	-	-	-	-	-	-	9.51E-03
Oxalate	-	-	1.18E+05	-	2.05E+05	-	-	-	-	-	-	-
Zirconium	5.35E+06	-	1.43E-08	1.43E-05	-	-	-	-	-	-	1.00E+07	1.26E+04

4.0 INTERFACE FLOW PARAMETERS

The IFPs are parameters which have the ability to affect or restrict the flow and/or properties (e.g., viscosity, weight percent solids) of interfaces between interfacing unit operations of the RPP facilities. As part of the BFD development, the IFPs that are expected to influence the RPP Reference Integrated Flowsheet or restrict changes to the flowsheet have been identified.

Each interface between facilities on the BFD (Figure 2-1) is numbered and each number corresponds to a set of IFPs. Many of the interfaces identified flow in two directions as indicated by double sided arrows on the BFD stream. In those cases, the IFPs are differentiated by the interface number followed by an ‘a’ or ‘b’ designation to identify flow direction.

In order to identify the IFPs relevant to each interface, documentation of the existing and planned RPP facilities was reviewed. The IFPs that were identified during the documentation review can be found in the IFP tables in Appendix B. Each IFP has been assigned a unique IFP number with the interface number listed first, an ‘a’ or ‘b’ designation to identify flow direction as needed, and a hyphen followed by a number to identify the individual IFP (i.e., 1a-1). Each IFP listing includes a description of the IFP, the source document or documents from which that IFP was identified, the document that implements the IFP in the field, and the IFP basis document that identifies the technical or environmental limitation that is the underpinning reason for the IFP. The notes column contains additional clarifying information regarding the IFP. IFPs for many interfaces are incomplete and under development; as they become available, new IFPs will be addressed in future revisions of this report.

Each IFP has been assigned a technical basis category to allow the reader to quickly identify if the IFP is related to operational, safety, or environmental restrictions. The operational basis category includes WAC such as those outlined in 24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*. Each IFP may fall under more than one technical basis category.

Additionally the IFP table includes a short description of any simplifications used in modeling the IFP in HTWOS. This information is intended to provide the reader with insight into whether the IFP is fully reflected in HTWOS and whether changes to the IFP would be expected to be reflected in modeling performed in the HTWOS model.

The IFPs which received the most scrutiny during the development of this first issuance of the IFP list are those related to the DFLAW (Phase 2) and DFHLW (Phase 3) portions of the RPP Mission. Due to time constraints, IFPs that are considered less influential to the TWDIF, such as Site Utilities, were not reviewed for this revision and will be addressed in future revisions of this report.

5.0 CONCLUSION AND RECOMMENDATIONS

The RPP Reference Integrated Flowsheet presented here consists of the TWDIF BFD, associated IFPs, and mass flows for the interfaces. The TWDIF activity provides a look at the ability of the RPP Mission to process waste by focusing on the interfaces between facilities and processes rather than the timeframe for waste processing. The TWDIF team will maintain the RPP Reference Integrated Flowsheet, updating it as required to incorporate changes in planned systems and facility operations.

While the TWDIF activity uses a phased approach to the RPP Mission, the DFLAW and DFHLW phases are not required to achieve the final balance of mission phase, but rather are being considered in order to facilitate the start of tank waste immobilization as soon as practicable.

The development of the RPP Reference Integrated Flowsheet has informed the development of a list of TWDIF GROs and an associated TWDIF Technical Roadmap to recommend technical pathways to close the gaps, mitigate risks and realize opportunities described in the GROMP. The TWDIF GROs have identified many risks to the RPP Reference Integrated Flowsheet presented in this report, indicating that further flowsheet development and potential mitigations may be warranted. Listed below are recommendations and items for consideration when updating and refining the RPP Reference Integrated Flowsheet during the next FY and beyond.

5.1 MODELING UPDATE

The mass flow modeling should be updated at least annually. To the extent practical, the modeling updates should include any flowsheet revisions identified or approved by the TWDIF team, the most recent planning available (e.g., Tank 241-AY-102 mitigation plans, A and AX Farm retrieval plans), technical updates investigated as part of the TWDIF technical roadmap (e.g., the carryover of glass formers in the LAW melter offgas), and any improvements to the inputs (e.g., improved estimates of organic concentrations). The update should also include expansion of the key analyte list to include organic constituents important to the WTP performance assessment. Other considerations for the update include identification of rate limiting factors (e.g., evaporator capacity), comparison of results to requirements identified in the IFPs (e.g., waste acceptance criteria), and inclusion of chemical compounds rather than just elemental constituents.

5.2 INTERFACE FLOW PARAMETER BASIS DOCUMENT REVIEW

A partial review of the technical basis underpinning the IFPs was conducted for this report; however, there was not time to conduct a thorough review. A method of identifying IFPs that potentially have a high impact on the flowsheet should be developed and, based on those IFPs with high impact, a detailed review of their technical bases should be conducted. IFPs may also require the addition of further details (e.g., requirements for specific analytical techniques to verify compliance).

5.3 DEVELOP INTERFACE FLOW PARAMETERS

There are a number of IFPs, such as those for support interfaces and systems, that were not addressed in this revision. The consolidation of IFPs for these interfaces is still needed.

6.0 REFERENCES

24590-WTP-ICD-MG-01-019, 2013, *ICD 19 – Interface Control Document for Waste Feed*, Rev. 6, Bechtel National, Inc., Richland, Washington.

Hanford Tank Waste Retrieval Treatment, and Disposition Framework, September 24, 2013, U.S. Department of Energy, Washington, D.C.

MMR-13-059, 2014, *Input FY2012 Tank Inventory into HTWOS*, Rev. 0, Washington River Protection Solutions LLC, Richland, Washington.

MMR-14-024, 2014, *TWDIF Flowsheet Modeling*, Rev. 1, Washington River Protection Solutions LLC, Richland, Washington.

ORP-11242, 2011, *River Protection Project System Plan*, Rev. 6, U.S. Department of Energy, Office of River Protection, Richland, Washington.

RPP-33715, 2014, *Double-Shell and Single-Shell Tank Inventory Input to the Hanford Tank Waste Operations Simulator Model – 2014 Update*, Rev. 6, Washington River Protection Solutions LLC, Richland, Washington.

RPP-PLAN-56634, 2014, *One System Plan for Developing and Managing the Tank Waste Disposition Integrated Flowsheet*, Rev. 0, Washington River Protection Solutions LLC, Richland, Washington.

SVF-2931, 2014, *SVF-2931-02 TWDIF Flowsheet Calculations*, Rev. 2, Washington River Protection Solutions LLC, Richland, Washington.

TFC-PLN-143, Rev. A, "River Protection Project System Integration Management Plan," Washington River Protection Solutions, LLC, Richland, Washington.

APPENDIX A

TANK WASTE DISPOSITION INTEGRATED FLOWSHEET (TWDIF) COMPOSITIONAL AND PHYSICAL PROPERTIES BASES EVALUATION

APPENDIX A

LIST OF TERMS

Abbreviations and Acronyms

BBI	Best Basis Inventory
CI	confidence interval
DST	double-shell tank
DQO	data quality objective
ESP	Environmental Simulation Program
HDW	Hanford defined waste
HLW	high-level waste
HTWOS	Hanford Tank Waste Operations Simulator
LAW	low-activity waste
ISM	Integrated Solubility Model
PNNL	Pacific Northwest National Laboratory
PSD	particle size distribution
PT	Pretreatment
RPP	River Protection Project
SST	single-shell tank
TWDIF	Tank Waste Disposition Integrated Flowsheet
UDS	undissolved solids
WRPS	Washington River Protection Solutions LLC

Units

ft/s	foot per second
g/cm^3	grams per cubic centimeter
wt %	weight percent

A1.0 TWDIF Compositional and Physical Properties Bases Evaluation

This discussion provides a summary of the current understanding of the tank waste compositional basis and physical properties such as particle size, particle density, and rheological behavior, specifically related to their use in the Hanford Tank Waste Operations Simulator (HTWOS)-based River Protection Project (RPP) Mission Flowsheet while acknowledging their potential application in future flowsheet models.

A1.1 Compositional Basis for the Tank Waste Disposition Integrated Flowsheet (TWDIF)

The HTWOS model is a dynamic, event simulation model, governed by prescribed initial conditions, constraints, and operating logic that is used to simulate the full duration of the RPP Mission and will be used for the TWDIF FY 2014 effort. Information on the tank composition and amounts of waste in each tank are required to begin the modeling efforts. The Best Basis Inventory (BBI) is the source of current tank waste inventories used by HTWOS (see RPP-17152, *Hanford Tank Waste Operations Simulator (HTWOS) Version 7.7 Model Design Document*). The BBI is not listed as an assumption, but as an input to HTWOS which establishes the initial waste inventory. No uncertainty is applied to the values in the BBI during the HTWOS evaluations.

It was assumed for this analysis that any component with a limit in the Waste Treatment Plant (WTP) Data Quality Objectives (DQOs) was a key analyte to be tracked through the RPP Mission Flowsheet. In addition, oxalate was added to the list as an important analyte due to its impact on waste chemical stability, sludge washing and melter reduction/oxidation calculations.

The Hanford waste tank contents as defined in the BBI include uncertainties in the quantity and constituents of the waste contained in the individual waste tanks. Document RPP-RPT-54509, *One System – Hanford Tank Waste Characterization Vulnerability Assessment*, reports that 145 of 177 tanks [76% of single-shell tanks (SSTs) and 100% of double-shell tanks (DSTs)] have had at least one sample taken of their contents leaving 32 tanks un-sampled. Within those which have been sampled, 106 tanks have had core samples. Process knowledge estimates have been prepared for all waste layers in all waste tanks to fill in the gaps in the sample data. While the process knowledge information is not as accurate as sample data, it does provide an estimate of what is in each tank. The BBI combines sample data, where available, with process knowledge information. As the BBI is updated, new sample data have generally been found to be consistent with process knowledge estimates.

The process knowledge estimates are based on the Hanford Defined Waste (HDW) model, which tracks the fuel batches through the Hanford production reactors. Processing plant flowsheets and essential material records are used to estimate the composition of waste streams discharged to the tank farm. Waste type “templates” were developed for 41 solid and 49 liquid waste types based on the HDW model. Sampling data were used to supplement the HDW model composition estimates for 22 solid and 5 liquid waste type templates. Transfer records provide a basis for estimating how much of each waste type is in each tank. The current HDW model is in its 5th Revision and can be found in RPP-19822, *Hanford Defined Waste Model-Revision 5.0*.

The current BBI database tracks inventory for standard analytes (25 chemicals and 46 radionuclides) for every waste phase (i.e., saltcake, sludge, and liquid). Inventories for up to 112 supplemental BBI analytes are included only when sample data are available for all waste phases in a tank or process knowledge values can be calculated from combined sample results. Data for the standard analytes is generally available for all tanks, while data for supplemental analytes is frequently not included in the BBI. Attachment A, Table 1 and Table 2, show the analytes of interest for the WTP DQOs and whether the analyte is a standard or supplemental analyte in the BBI. The DQO lists a large number of organic species, these are not included in Attachment A since no limits are listed for these components. Some of the required data is not contained in the BBI database.

A review of the BBI was performed in RPP-RPT-54509 to determine the quality of the data for selected analytes deemed important to waste processing. This review determined that most information in the BBI was of high quality, and that compositions based on process knowledge generally matched sample results when samples were pulled. However, selected tanks that primarily used process knowledge as the basis for the tank composition were singled out and additional sampling was recommended to decrease the uncertainty in the composition. Selected analytes were generally associated with a high level of uncertainty. These analytes frequently had low concentrations in all but a few tanks and had process knowledge based concentrations in the tanks with high concentrations (RPP-RPT-54509).

The BBI content was reviewed here to determine where gaps in the compositional data existed with summary results shown in Table 3 of Attachment A. It should be noted that this review simply identified whether or not a value has been assigned in the BBI for each analyte. The review did not attempt to ascertain whether or not the assigned value was a sample result, calculation from a sample result, or a process knowledge based value, and an assessment of the quality of the data was not performed. Cesium, plutonium, and technetium are not explicitly tracked in BBI, but can be calculated from the isotopic data.

The review indicates that significant gaps in compositional data are present for many of the minor species listed in the WTP DQO for high-level waste (HLW) processing. Compositional data quality issues were also identified in RPP-RPT-54509 and RPP-RPT-41279, *Confidence Intervals for Double Shell Tank Constituent Concentrations*, further concluded that, "Concentrations of the chemical constituents varied considerably from tank to tank and sometimes considerably within a tank or within a single core. Because of the variation within a core, confidence intervals (CIs) are frequently quite wide. In some cases, a wide CI will reflect substantial variation in the tank. In other cases, the wide CI will be a product of small sample size." Sampling during retrieval and blending has been recommended in ORP-11242, *River Protection Project System Plan*, to increase confidence in the composition of the wastes to be blended and this sampling would help mitigate the risk of preparation of an out-of-specification batch as a result of the lack of compositional data for selected species.

HTWOS tracks the elemental species as the oxide form in the solids fraction for all elemental components except aluminum and chromium (RPP-17152). Aluminum is split between gibbsite and boehmite, while chromium is split between chromium oxide and chromium oxyhydroxide.

Bound hydroxide and oxygen for the solids are listed as separate entries as are soluble versus insoluble carbonate, oxalate, phosphate and other anions.

The split of analytes into the solids or liquid fraction of the waste in the BBI represents the waste as it is in the waste tank. During retrieval, water will be added to mobilize the waste. “Wash factors” are assigned to each analyte in BBI based on the results of 4:1 dilution testing performed by Pacific Northwest National Laboratory (PNNL) in HNF-3157, *Best-Basis Wash and Leach Factor Analysis*. The wash factor is utilized by HTWOS to partition solids to the liquid fraction during retrieval. The use of these wash factors is a known issue and efforts are in progress to replace these factors with a solubility model in HTWOS (see RPP-PLAN-46002, *Wash and Leach Factor Work Plan*). The HTWOS model runs for TWDIF incorporated the Integrated Solubility Model (ISM) to replace some of the wash factors. It should be noted that selected analytes are not predicted well by this model (see RPP-RPT-54310, *Integrated Solubility Model Implementation Overview* and RPP-53089, *Evaluation of the HTWOS Integrated Solubility Model Predictions*).

“Leach factors” are also reported in BBI to allow the partitioning of waste analytes during caustic leaching. Similar to the wash factors, the use of these leach factors is a known issue and efforts are in progress to replace these factors with a solubility model in HTWOS (see RPP-PLAN-46002). Similar to the wash factors, some of the leach factors were replaced in the TWDIF HTWOS model runs with ISM.

A1.2 Solids Particle Density

Consensus on solids particle densities for individual solid constituents and bulk tank solids is important as these values directly influence assessments of slurry transfer, solids mixing and settling, and tank waste inventory and retrieval plans. A list of 36 non-salt and 16 salt sludge constituents have been identified with associated primary particle crystal size and densities in PNNL-20646, *Hanford Waste Physical and Rheological Properties: Data and Gaps*, and deemed by an expert panel review as key constituents influencing tank farms retrieval, transfer, and feed staging as well as WTP’s pretreatment processing and vitrification throughput. However, a problem exists in adequately representing the nature of the tank waste solids (i.e., agglomerate size, shape, and density) and limited analytical data for flowsheet design.

The solids density issue is best divided into two main categories based on how the solids density values are used. The first main category of use is settled solids and bulk solids volume calculations used in both the HTWOS and the WTP flowsheet model and the second use is related to critical velocity, settling rate, and mixing related calculations. The latter will not be discussed in detail here as it is a significantly more complex discussion and does not directly influence the HTWOS model run for this TWDIF flowsheet effort. This discussion focuses on the flowsheet model use of solids density values, current quoted values and basis sources, and a recommended path forward for use in the RPP Mission Flowsheet model run.

A1.3 River Protection Project Mission Model Use

The volume of bulk solids (i.e., settled solids) in a tank is an important measurement in the HTWOS model as it determines the depth of settled solids in a tank, which in turn dictates the equipment requirements, transfer limitations, and waste retrieval methods for the tank. Furthermore, solids loading is restricted to 10 wt% for tank waste transfers to the Pretreatment (PT) Facility, and the dry-basis solids density is used to estimate the volume percent solids. The HTWOS model calculates bulk solids volume via two different methods: one based on the weight percent solids basis and the other is based on the volume percent solids basis. The modeler decides which method to assign to each tank.

The method based on weight percent solids uses a fixed dry solids density of 3.0 g/cm^3, combines the total solids mass with a fixed weight percent dry solids in settled solids, and a calculated interstitial liquid density to estimate settled solids volume. The fixed weight percent dry solids in settled solids, when insoluble solids are retrieved from SSTs and currently in the DST system, are modeled as settling to 40 wt% solids[1] within 30 days, except for those in C Farm. Insoluble solids retrieved from C Farm SSTs are modeled as settling to a volume percent settled solids comparable to that in the source SSTs within two days of transfer to a DST. This approach is very susceptible to the accuracy of the assumed fixed weight percent dry solids in settled solids and assumed fixed solid particle density of 3.0 g/cm^3.

The fixed weight percent of 40 wt% (settled solids loading endpoint) is based on an analysis of the sludge in Tank 241-AY-102 (AY-102). Analysis of data from a core sampling event showed that the solids have compacted to about 48.7 wt% (dry solids). The water content is about 42.2%, and the remaining 9.1% of the sludge consists of dissolved solids in the interstitial liquids. The HTWOS model converts all weight percent solids basis tanks to the volume percent and tracks the volume of settled solids by the vol% method calculation in all subsequent calculations.

The volume percent method uses a measured initial settled volume of solids that is associated with that tank based on first settling the initial waste contents by the weight percent method (assumes 40 wt% dry solids in settled solids) to determine the volume percent dry solid in settled solids. The volume of settled solids is then determined using the total mass of solids, a fixed solids density of 3.0 g/cm^3, and the volume percent of dry solids in settled solids. This volume percent measurement is then maintained for the tanks' solids as they are transferred to different tanks. Both of these calculation methods are describe with more detail in Section 2.6.9 of RPP-17152.

In WTP's dynamic G2 model the volume of material in a unit operation is calculated by analyzing the amount and types of components in the unit's component array and multiplying the

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[1] Calculated distributions of the mass fraction of UDS in Hanford sediments are provided in PNNL-19245, Section 3.2. Depending on what fraction of Hanford sediment is considered (all, sludge, DSTs, sludge DSTs), 40 wt% ranges from the 30th to 55th percentile based on tank count.

solids mass by 3.0 g/cm^3. The solid and oxide components[2] have constant density values while the overall density for solids is approximated at 3.0 g/cm^3. In equipment where oxide exists, the oxide volume is added to the solid volume and the total volume is a sum of the partial volumes of liquid and solid. Using the constant densities, the volumes of solids and oxides are determined. This fixed solid particle density approach can underestimate the volume occupied by agglomerates as the density value approaches crystal densities of undissolved solids (UDS) components. However, a higher particle density assumption predicts higher solids loading (more conservative) in fixed volume transfers.

The second main category of solid particle density use relates to calculations to predict slurry transfer, storage, solids mixing and settling. Document PNNL-20646 provides a well-referenced discussion pertaining to the application of waste physical properties to these calculations and addresses the gaps and limitations in detail. Document PNNL-20646 is also used as the basis for the TOC waste feed delivery system evaluation in RPP-RPT-53931, *One System Waste Feed Delivery Mixing Performance and Solids Accumulation Test Report*, and RPP-RPT-51652, *One System Evaluation of Waste Transferred to the Waste Treatment Plant*. Regarding solids particle density, PNNL-20646 used the 2002 BBI composition and the Environmental Simulation Program (ESP)[3] chemical thermodynamic model to generate a first approximation of the unwashed phases present. An expert technical panel identified a consensus list of 36 non-salt and 16 salt sludge constituents, along with associated primary particle crystal densities, as key UDS constituents. The definition of these solid phases (UDS phases) is a major basis for the definition of particulate density in PNNL 20646. Informational gaps are reported and include the following:

1) Hanford wastes contain mixed phases consisting of non-stoichiometric ratios of various metals. Thus, the proportions of the compounds present may vary from tank to tank. The densities of the mixed phases, which are between those of the individual compounds in the mixture, will vary correspondingly. The presence of mixed phases therefore introduces a potentially large uncertainty in density.

2) The present extent of hydration of some phases that originally precipitated as hydroxides has been questioned and results in uncertainty. In addition, amorphous phases exist that cannot be identified with X-ray diffraction (XRD). Assuming that these amorphous phases are anhydrous oxides would significantly overestimate the densities of any hydroxides that are present. Conversely, assigning the metals to hydroxide phases would underestimate the densities of anhydrous oxide phases.

A summary table of the 52 solid phase sludge constituents and associated primary particle densities is provided in Table 3.11 of PNNL-20646. In addition, the solid-phase compositions

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[2] Glass former quantities in the oxide form are calculated using the LAW and HLW glass models. However, minerals equivalent to the calculated oxide glass formers are actually transferred to the Melter Feed Preparation Vessels (MFPVs). These minerals contain the glass former oxides, impurities, and water moisture. ILAW glass and glass formers added to LAW melters are assumed to have a density of 2.58 g/cm^3. IHLW glass and glass formers added to the HLW melters are assumed to have a density of 2.66 g/cm^3.

[3] ESP was supplied and developed by OLI Systems, Inc., Morris Plains, New Jersey.

and average solid-particle densities by tank, waste type, and composite are provided in Appendix C of PNNL-20646. A key mineralogy reference document, RPP-RPT-46618, *Hanford Waste Mineralogy Reference Report*, was revised in 2011 and is periodically revised providing an updated summary of mineralogical information for solids contained within the Hanford tanks. Any subsequent evaluations should consult this updated report to incorporate new mineralogical data, where applicable.

A1.4 Current Solids Density Values and Technical Basis

A review of literature was completed pertaining to Hanford waste transfer and retrieval, waste properties, and flowsheet model designs. As stated in the preceding solids density data use discussion, the current HTWOS model (version 7.5) assumes a dry-basis solids density of 3.0 g/cm^3 for all solid particles and this value is documented and discussed in RPP-17152 with the underlying basis hinging only upon the reported average solids density in RPP-9805, *Values of Particle Size, Particle Density, and Slurry Viscosity to Use in Waste Feed Delivery Transfer System Analysis*. WTP's flowsheet model design document 24590-WTP-MDD-PR-01-002, *Dynamic (G2) Model Design Document*, similarly uses 3.0 g/cm^3 for all solid particles with no discussion of the origin or technical basis for the fixed value. Furthermore, Tank AY-102 calculations in SVF-1874, *AY-102 Flowsheet Input Data.xlsx* and SVF-1875, *AY-102 Flowsheet Material Balance.xlsx*, and reported in RPP-RPT-46020, *Tank 241-AY-102 Waste Feed Delivery Flowsheet*, provide volume percent solids estimates based on a fixed solid particle density of 3.0 g/cm^3, however, other density estimates for slurry density, apparent solid particle density, and settled solids density are used in predicting material handling and transfers controls.

Most recently, Washington River Protection Solutions (WRPS) updated TFC-ENG-STD-26, "Waste Transfer, Dilution, and Flushing Requirements," and identified 3.9 g/cm^3 as the assumed solids density when specific particle and solids fraction data is not available for critical velocity transfer calculations. This density value originated from RPP-9805 and represents the calculated 95/95-tolerance limit for the density of dry solids in the 8 HLW tank dataset. WRPS also recently completed a study (RPP-RPT-55561, *High-Level Waste Undissolved Solids Evaluation*) to estimate the existence and extent of hard-to-handle solids in waste tanks using particle size distribution (PSD) data and model predictions of solids density. A new agglomerate and aggregate model was developed by assuming a heterogeneous particle cluster forms from nonselective mixture of solid phases. RPP-RPT-55561 reported an average non-salt only compound density of 3.63 g/cm^3 based on 22 selected tanks justified by PSD data quality.

Table A-1 summarizes solids density values and various sources discovered in this solids particle density review. A notable observation is three of the dry-basis solid density values presented in Table A-1 have no identifiable basis. Next, the 3.0 g/cm^3 density value is found to be a common solids density basis (4 reported instances), and yet, obtained through different approaches. For example, RPP-RPT-46020 reports density from a centrifuged solid density measurement of a tank AY-102 core sample where document RPP-17152 states a rounded value based the average solids density reported in RPP-9805. The next group of solids density values in Table A-1 was estimated from a simple mass or volume-weighted average solids density based on crystal densities where the breadth of the dataset was the key difference in obtaining a final reported value. For example, RPP-9805 presented a 2.9 g/cm^3 value estimated from the average of mass-weighted densities using dry-basis mineral compositions of solids constituents in 8 High Level Waste (HLW) tanks as estimated by ESP using BBI analytical data and literature values for mineral densities. Document PNWD-3824 (WTP-RPT-153), *Estimate of Hanford Waste Insoluble Solid Particle Size and Density Distribution*, presented an average solids density of 2.8 g/cm^3 estimated from volume-weighted crystal densities using dry-basis mineral compositions of 16 solid constituents in 177 tanks using BBI analytical data and literature values for mineral densities. Subsequent work in PNNL-20646 reported average solids density of 2.5 g/cm^3 and 2.292 g/cm^3 calculated from mass-weighted crystal densities and using dry-basis mineral compositions of 36 non-salt phases and 16 salt phases in 177 tanks for the composite of tanks with >70% sludge and for all tanks, waste types, and composites, respectively. Document RPP-RPT-55561 provides a 3.63 g/cm^3 average non-salt only solid density based on 22 tanks using 36 non-salt phases (same phases identified in PNNL-20646). The next to the last entry in Table A-1 contains a 2.18 g/cm^3 average effective solid density estimate in RPP-9805. This density differs from the average mass-weighted density (i.e., 2.9 g/cm^3) reported in RPP-9805 by adjusting for interstitial liquid using bulk physical properties and in-tank sludge conditions (e.g., porosity, solid volume) and volume fractions based on measured data from ten HLW tanks. The last entry Table A-1 represents an apparent solid phase density estimate of 2.05 g/cm^3 provided in SVF-1875, and was determined by solving for solid phase density to meet a measured reference inventory bulk waste level in Tank AY-102.

A wide range (2.05 to 3.9 g/cm^3) of solids density values are reported in Table A-1 and provide a dramatic illustration of the uncertainty associated with solids phase identification of Hanford waste, predicting the associated agglomerate density of the complex solid compound, and estimating tank waste solids inventory. For the purposes of estimating settled solids and bulk solids volume for the RPP Mission Flowsheet model run, an average particle density of 3.0 g/cm^3 appears to be an adequate basis for estimating solids volumes while conducting test flowsheet cases. However, consensus technical agreement does not exist on the appropriate solids density value for use in critical velocity, settling rate, and mixing related calculations. This more complicated discussion is better addressed in the related literature cited in this review.

Table A-1. Summary of Solids Particle Density Source Documents and Technical Bases.

Solids Density Value	Source Document and Location	Justification/Technical Basis
3.9 g/cm^3	TFC-ENG-STD-26, "Waste Transfer, Dilution, and Flushing Requirements," Attachment D (Issue Date June 23, 2014).	From RPP-9805, this density represents the calculated 95/95-tolerance limit for the density of dry solids in the 8 HLW tank dataset.
3.63 g/cm^3	RPP-RPT-55561, *High-Level Waste Undissolved Solids Evaluation.* Table 6.3.	The results represent the non-salt only average composite undissolved solids density for 22 tanks.
3.0 g/cm^3	WHC-SD-WM-RPT-229, *Initial Retrieval Sequence and Blending Strategy,* Table C-1.	None
3.0 g/cm^3	RPP-17152, *Hanford Tank Waste Operations Simulator (HTWOS) Version 7.7 Model Design Document,* Section 2.5.2.	From RPP-9805, represents an average, rounded density value, and based on dry-basis mineral compositions of solids constituents in 8 HLW tanks as estimated by ESP using BBI analytical data and literature values for mineral densities.
3.0 g/cm^3	24590-WTP-MDD-PR-01-002, *Dynamic (G2) Model Design Document*, Section 4.6.	None
3.0 g/cm^3	RPP-RPT-46020, *Tank 241-AY-102 Waste Feed Delivery Flowsheet*, Section 5.1.4.1.2, Page 48.	Estimate based on centrifuged solid density measurement of a Tank AY-102 core sample. Assumes the centrifuged solid mass consists of dry basis solids and residual interstitial liquor remaining after centrifugation, while the centrifuged solid volume consists of the displacement volume from dry basis solid plus the displacement volume of residual interstitial liquor plus void spaces (i.e., air gaps) within the centrifuged solids). The void fraction of air gaps are then assumed to be ~0 and only represented by the void due to the interstitial liquor.
2.9 g/cm^3	RPP-9805, *Values of Particle Size, Particle Density, and Slurry Viscosity to Use in Waste Feed Delivery Transfer System Analysis*, Table 4.4.	Dry-basis mineral compositions of solids constituents in 8 HLW tanks as estimated by ESP using BBI analytical data and literature values for mineral densities.

Table A-1. Summary of Solids Particle Density Source Documents and Technical Bases.

Solids Density Value	Source Document and Location	Justification/Technical Basis
2.8 g/cm^3	WTP-RPT-153, *Estimate of Hanford Waste Insoluble Solid Particle Size and Density Distribution,* Page 5.21.	Based on Case 1 [Sonicated particle size distribution (PSD)] and Case 3 (Minimal Disturbance PSD) where no adjustment is made for agglomerate densities, volume-weighted average density using dry-basis mineral compositions of 16 solid constituents in 177 tanks as estimated by ESP using BBI analytical data and literature values for mineral densities.
2.7 g/cm^3	24590-WTP-RPT-PT-02-005, *Flowsheet Bases, Assumptions, and Requirements,* Section 1.3.3.1.1.	None
2.5 g/cm^3	PNNL-20646, *Hanford Waste Physical and Rheological Properties: Data and Gaps,* Table C-1, Page C.24.	Solid density for all as-is solids-phase composition data, *for composite of tanks with >70% sludge*, based on 2002 BBI with solubility modeling and actual waste experience. Underlying mass fractions of total solids based on 36 non-salt phases and 16 salt phases from Table 3.11 in PNNL-20646.
2.292 g/cm^3	PNNL-20646, *Hanford Waste Physical and Rheological Properties: Data and Gaps,* Table C-1, Page C.23.	Average solid density for all as-is solids-phase composition data, *for all tanks, waste types, and composites*, based on 2002 BBI with solubility modeling and actual waste experience. Underlying mass fractions of total solids based on 36 non-salt phases and 16 salt phases from Table 3.11 in PNNL-20646.
2.18 g/cm^3	RPP-9805, *Values of Particle Size, Particle Density, and Slurry Viscosity to Use in Waste Feed Delivery Transfer System Analysis,* Table 4.4.	Average effective solid density based on measured bulk physical properties and in-tank sludge conditions to estimate solid densities and volume fractions for ten HLW tanks (8 HLW tanks in same report plus AW-104 and C-106). Solid density calculations used are adjusted for interstitial liquid.
2.05 g/cm^3	SVF-1875, *AY-102 Flowsheet Material Balance.xlsx*.	Apparent solid phase density for Tank AY-102 determined by solving for solid phase density to meet a measured reference inventory bulk waste level. Defined as kilograms of dry-basis solid per l L of solid displacement volume.

A1.5 Particle Size Distribution (PSD)

A representative particle size distribution is desired to predict successful waste transfer, mixing, and settling in waste retrieval and WTP operations. However, the scope of the discussion here is bound by the need to summarize documentation of existing PSD bases and the recommended input (if applicable) for the execution of the TWDIF flowsheet effort.

HTWOS does not currently track a general or individual tank waste PSDs during modelling, so no PSD basis exists for the assumed transfers meeting or exceeding the allowed transfer properties for the planning documents that utilize HTWOS as the flowsheet model. However, planning documents not directly impacting the HTWOS model do contain assumptions of necessary critical velocity, mixing abilities, and settling rates. Furthermore, the WAC to the PT Facility designates a maximum particle size allowed for feed qualification. The discussion that follows documents various sources of summary PSD information for Hanford waste and as stated above this PSD information does not directly input to the HTWOS model and no recommendations for the application of this summary PSD information is provided here.

The current basis document used for the pipeline pressure drop calculations for the waste feed delivery transfer system analysis is provided in RPP-9805 and summarized in Table A 2. The 95% UL (confidence limit) is interpreted as 95% confident that the “true” mean for all wastes will be less than the computed value where the 95/95 TL (Tolerance Limit) provides 95% confident that at least 95% of the tanks will have a particle size less than the computed value. The 95/95 TL distribution was used as the bounding distribution in RPP-5346, *Waste Feed Delivery Transfer System Analysis*, in designing the Waste Feed Delivery system and gave rise to the maximum expected WTP feed critical velocity of 4 ft/s.

As summarized in Table A-2, subsequent evaluations of existing tank waste sample data to estimate physical properties were completed in 2007 in PNWD-3824 (WTP-RPT-153) and PNNL-16857, *Estimate of Hanford Waste Rheology and Settling Behavior*, and more recently in PNNL-20646. In comparison to the work based on 7 HLW tanks in RPP-9805, the more recent work in PNNL-20646 compiled sludge PSD data sets from 22 tanks to report a volume-weighted average composite PSD representing greater than 50% by UDS volume for 5 of the 13 primary waste types for Sludge, Flowing Unsonicated. Evaluation of the waste feed delivery system by WRPS used the Sludge, No-Flow Unsonicated data from PNNL 20646 as the basis for simulant design in the tank operations contractor waste feed delivery system performance testing (see RPP-RPT-53931) and for the One System particle size basis in limits of technology calculations (see RPP-RPT-51652).

Most recently, a PSD evaluation was completed in RPP-RPT-55561 and is also summarized in Table A-2. Lastly, a revision to RPP-RPT-52841, *Hanford Waste Particle Size Reference Report*, was released in March of 2014 providing the most recent summary of all currently identified sources for PSD information for Hanford tank wastes. Any subsequent evaluations should consult this updated report to incorporate new PSD data, where applicable.

Table A-2. Summary of Sludge UDS PSD Source Documents and Technical Bases.

	PSD Values							Source Document and Location	Justification/Technical Basis
	1%	5%	25%	50%	75%	95%	99%		
Mean	0.7	1.2	3.7	7.5	31	140	210	RPP-9805, *Values of Particle Size, Particle Density, and Slurry Viscosity to Use in Waste Feed Delivery Transfer System Analysis*, Table 4.4.	Average of mean PSDs for 7 individual HLW tanks using laboratory PSD data reported in HNF-8862, for a Horiba LA-910 analyzer, under a 300 ml/min flowing condition with minimal turbulence/disturbance, and first measurement results after sample introduction prior to subsequent successive measurements in flowing cell which generally produced smaller size distributions.
95% UL	1	1.6	5	11	58	210	310		
95/95 TL	2	3.1	10	22	160	460	700		
All Minimal Disturbance	0.65	1.0	2.8	6.31	14.0	58.6	256	PNWD-3824 (WTP-RPT-153), *Estimate of Hanford Waste Insoluble Solid Particle Size and Density Distribution*, Table 3.1.8.	Composite PSD data, from volume-weighted average of individual tanks using as-received compositions only based on May 2002 BBI, combined from 19 sludge tanks with minimal disturbance in a flowing particle size analyzer cell with measurements taken prior to sonication. The inclusion and exclusion of specific PSD data sets is justified in Section 3.1.2 and the stepwise method used to generate the composite PSD is described in Section 3.1.4 of PNWD-3824.
Used equivalent composite PSD to PNWD-3824								PNNL-16857 (WPT-RPT-154), *Estimate of Hanford Waste Rheology and Settling Behavior*.	Particle size data used in this report were obtained from PNWD-3824. No modifications were made to the data. The data reported in the tables are the particle diameter for cumulative volume percents ranging from 1 to 99%.
Sludge, Flowing Unsonicated	0.48	0.94	2.9	6.9	14.7	68.7	275.1	PNNL-20646 (EMSP-RPT-006), *Hanford Waste Physical and Rheological Properties: Data and Gaps*, Table 3.26.	"Sludge, Flowing Unsonicated" composite PSD data, combined from 22 sludge tanks, using updated PSD data sets from PNWD-3824 with 23 additional references including data from M12 work scope characterizing 6 sludge waste groups representing approximately 75% of the expected waste to be processed through WTP. PSD data set down-select criteria are similar to those in PNWD-3824, but adjusted and discussed in Section 3.2.5.1. "Sludge, No-Flow Unsonicated" composite PSD data from 13
Sludge, No-Flow Unsonicated	0.62	0.88	2.58	6.22	29.77	162.41	858.48		

Table A-2. Summary of Sludge UDS PSD Source Documents and Technical Bases.

	PSD Values							Source Document and Location	Justification/Technical Basis
	1%	5%	25%	50%	75%	95%	99%		
									sludge tanks.
Mean	N/A	N/A	N/A	16.53	N/A	197.01	334.68	RPP-RPT-55561, *High-Level Waste Undissolved Solids Evaluation*, Table 5.3	Composite PSD data from 8 sludge tanks. A total of 22 tanks were considered in report including sludge and saltcake waste, but separated tanks into "Smaller Particle Size Range" set (14 tanks) and "Larger Particle Size Range" set (8 tanks). Cumulative distribution points between 20 and 100 are reported in RPP-RPT-55561 at every 10 percent, but the three entries shown are the only bins that match the base table set reported by others.
95% UL				26.76		229.55	405.30		
95/95 TL				65.19		351.83	670.69		

A1.6 Tank Waste Rheology

The waste stored at Hanford consists of liquids containing dissolved salts (supernate), precipitated salts, and relatively insoluble sludge solids. Transfers of the tank waste can be supernate only [liquid or Low Activity Waste (LAW) transfers], or a mixture of supernate with insoluble solids [sludge or High Level Waste (HLW) transfers]. For LAW transfers, the viscosity is the rheological property of interest as these fluids are typically Newtonian. Yield stress and consistency (plastic viscosity) are the two parameters of interest for sludge transfers since these fluids are typically modeled as Bingham plastics.

HTWOS does not currently track rheological properties during modelling, so no basis exists for the assumed transfers meeting or exceeding the allowed rheological properties for the planning documents that utilize HTWOS as the flowsheet model. It is noted that modification of rheological properties can be made with additions of water to a LAW transfer or water/supernate to a HLW transfer so it is not expected that preparation of an out of specification batch would result in a prolonged schedule delay to remediate the batch to allow transfer to WTP. However, the WTP ultrafiltration rate and solids endpoint would be likely be impacted.

Attempts have been made to develop tools to predict the rheological properties of the waste. For LAW, a simple model has been developed, but not implemented in HTWOS (see RPP-RPT-51652). This model is relatively simple and further evaluation and/or development of the model is warranted prior to implementation as a predictive tool during flowsheet planning (see SRNL-STI-2013-00423, *Review of Rheology Models for Hanford Waste Blending*).

Limited data is available for the yield stress and consistency of the HLW sludge waste (PNNL-16857; PNNL-20646; RPP-52774, *Hanford Waste Rheological Reference Report*). In addition, prediction of these parameters from available data for blended and treated waste is not currently practical (see RPP-RPT-51652) and recent PNNL recommendations[4] call for additional measurements to enhanced understanding of concentrated slurry rheology and for predicting blended waste rheology. The Savannah River National Laboratory (SRNL) has performed limited work to develop methods for prediction of the yield stress and consistency for blends of material, but the rheological and physical properties of both streams to be blended must be known (see SRNL-STI-2013-00423). Further evaluation of the SRNL techniques could allow implementation of a similar approach for flowsheet planning at Hanford, but the lack of available data on existing tanks would limit the application of this tool and SRS has been unsuccessful (to date) in predicting the rheology of waste even with the considerable waste rheology data where Hanford waste rheology data is even more limited.

[4] Letter, Reid Peterson (PNNL) to Benton Harp (DOE-ORP). October 1, 2013. "Transmittal of PNNL Deliverable: Review of Blended Waste Rheology Correlations and Methodology in the Meacham Report."

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A3.0 Attachments

Attachment A-1. DQO Table Values versus BBI.

Table 1. WTP DQO Table 1 Analysis.

	DQO Limit		Flowsheet Basis	
	LAW	HLW	BBI Standard Analyte[(a)]*	BBI Supplemental Analyte
Bulk Density (kg/L)	<1.46	<1.5	X	
Waste Feed pH	≥ 12	≥ 12	X	
Maximum Solids Cw (wt%)	≤ 3.8	-	X	
Maximum Solids (g/L)	-	≤ 200	X	
Liquid Feed Unit Dose (Sv/L at 10M Na)	<1500	<1500	X	
Solids Feed Unit Dose (Sv/g dry solids)	<270	<270	X	
Slurry Viscosity (cP)[(b)]	< 21	-		
Slurry Consistency (cP) at 25 °C	-	<10		
Slurry Yield Stress (Pa) at 25 °C	-	<1.0		
Ammonia (NH_3) (M)	< 0.04	< 0.04		X
No Separable Organics	No Visible Layer			
PCBs (ppm)	< 50	< 50		X
TOC (wt%)	< 10	< 10	X	
Pu Metal Loading Ratio (g/kg)	< 6.20	< 6.20	X	
U Fissile to U Total Ratio (g/kg)	< 8.40	< 8.40	X	
Pu concentration of Liquid (g/L)	< 0.013	< 0.013	X	
Sodium (Na) (M)	< 10	< 10	X	

Attachment A-1. DQO Table Values versus BBI.

Table 1. WTP DQO Table 1 Analysis.

	DQO Limit		Flowsheet Basis	
	LAW	HLW	BBI Standard Analyte[(a)]*	BBI Supplemental Analyte
Hydrogen Generation Rate (gmol/hr-L)[(c)]	< 3.7E-7	< 2.1E-6	X	
Feed Temperature (°F)[(d)]	< 120	< 150		
Critical Velocity (ft/s)		< 4.0		
Maximum Solid Particle Size (microns)[(e)]		< 310		
Median particle Size (microns) [(f)]	< 11	< 11		
Arithmetic ave particle Hardness (mohs)[(f)]	< 4.4	< 4.4		
Temperature Change (°C)	± 20	± 20		

(a)* Includes items that are calculated from standard BBI analytes, such as feed unit dose.

(b) Meacham presented a model for liquid viscosity in RPP-RPT-51652, not incorporated into HTWOS.

(c) Although HGR can be calculated, measurement is required for WTP Qualification.

(d) Feed temperature is a function of many parameters, some of them operation such as pump run time.

(e) Draft.

(f) Under review.

Attachment A-1. DQO Table Values versus BBI.

Table 2. WTP DQO Table 2 Analysis.

	DQO Limit[(a)]		**Flowsheet Basis**	
	LAW	**HLW**	**BBI Standard Analyte***	**BBI Supplemental Analyte**
Annual Material Processed (Ci/yr)	≤ 1.1E8		X	
Abrasivity				
Chemical Species	**moles/mole Na**	**g/100 g oxide**		
Silver (Ag)	-	0.55		X
Aluminum (Al)	0.25	14	X	
Arsenic (As)	-	0.16		X
Boron (B)	-	1.3		X
Barium (Ba)	1.00E-04	4.5		X
Beryllium (Be)	-	0.065		X
Bismuth (Bi)	-	2.8	X	
Bromide	-	-		X
Calcium (Ca)	0.04	7.1	X	
Cerium (Ce)	-	0.81		X
Cadmium (Cd)	0.004	4.5		X
Chloride	-	-		
Chlorine (Cl)	0.037 (A,C) 0.089 (B)	0.33	X	
Cobalt (Co)	-	0.45		X

Attachment A-1. DQO Table Values versus BBI.

Table 2. WTP DQO Table 2 Analysis.

	DQO Limit[a]		Flowsheet Basis	
	LAW	HLW	BBI Standard Analyte*	BBI Supplemental Analyte
Carbonate (CO_3) (TIC)	-	30	X	
CN		1.6		X
Chromium (Cr)	0.0069 (A,C) 0.020 (B)	0.68	X	
Cesium (Cs)	-	0.58	X	
Copper (Cu)	-	0.48		X
Fluorine (F)	0.091 (A,C) 0.20 (B)	3.5	X	
Fluoride	-	-		
Iron (Fe)	0.01	29	X	
Mercury (Hg)	1.45E-05	0.1	X	
Potassium (K)	0.18	1.3	X	
Lanthanum (La)	8.30E-05	2.6	X	
Lithium (Li)	-	0.14		X
Magnesium (Mg)	-	2.1		X
Manganese (Mn)	-	6.5	X	
Molybdenum (Mo)	-	0.65		X
Sodium (Na)	-	19	X	

Attachment A-1. DQO Table Values versus BBI.

Table 2. WTP DQO Table 2 Analysis.

	DQO Limit[(a)]		Flowsheet Basis	
	LAW	HLW	BBI Standard Analyte*	BBI Supplemental Analyte
Neodynium (Nd)	-	1.7		X
Nickel (Ni)	0.003	2.4	X	
Nitrite (NO_2)	0.38	36	X	
Nitrate (NO_3)	0.8	36	X	
Phosphorus (P)	-	1.7	X	
Lead (Pb)	6.80E-04	1.1	X	
Palladium (Pd)	-	0.13		X
Phosphate (PO_4)	0.038 (A,C) 0.13 (B)	-	X	
Praseodymium (Pr)	-	0.35		X
Plutonium (Pu)	-	0.54	X	
Pu isotopes	-	-	X	
Rubidium (Rb)	-	0.19		X
Rhodium (Rh)	-	0.13		X
Rhodium (Rh) by ICP-MS	-	-		X
Ruthenium (Ru)	-	0.35		X
Sulfur (S)	-	0.65	X	
Antimony (Sb)	-	0.84		X

Attachment A-1. DQO Table Values versus BBI.

Table 2. WTP DQO Table 2 Analysis.

	DQO Limit[(a)]		Flowsheet Basis	
	LAW	HLW	BBI Standard Analyte*	BBI Supplemental Analyte
Selenium (Se)	-	0.52		X
Silicon (Si)	-	19	X	
Tin (Sn)	-	-		X
Sulfate (SO_4)	0.01 (A) 0.07 (B) 0.02 C	-	X	
Strontium (Sr)	-	0.52	X	
Tantalum (Ta)	-	0.03		X
Tantalum (Ta) by ICP-MS	-	-		
Technetium (Tc)	-	0.26	X	
Tellurium (Te)	-	0.13		X
Thorium (Th)	-	5		X
Titanium (Ti)	-	1.3		X
Thallium (Tl)	-	0.45		X
TIC	0.3	-	X	
Uranium (U)	0.012	14	X	
U Isotopes	-	-	X	
Vanadium (V)	-	0.032		X
Tungsten (W)	-	0.24		X

Attachment A-1. DQO Table Values versus BBI.

Table 2. WTP DQO Table 2 Analysis.

	DQO Limit[(a)]		Flowsheet Basis	
	LAW	**HLW**	**BBI Standard Analyte***	**BBI Supplemental Analyte**
Yttrium (Y)	-	0.16		X
Zinc (Zn)	-	0.42		X
Zirconium (Zr)	-	15	X	
Isotopes	**Bq/mole Na**	**Ci/100 g oxide**		
Ac-227	-	-	X	
Am-241	-	0.09	X	
Am-243	-	-	X	
Ba-137m	-	-		
C-14	-	6.50E-06	X	
Cd-113m	-	-	X	
Cm-242	-	-	X	
Cm-243/244	-	0.003		
Co-60	61,000 (A,B) 370,000 (C)	0.01	X	
Cs-134	-	-	X	
Cs-137	4.3E9 (A,C) 2.0E10 (B)	1.5	X	
Eu-152	-	4.80E-04	X	

Attachment A-1. DQO Table Values versus BBI.

Table 2. WTP DQO Table 2 Analysis.

	DQO Limit[(a)]		Flowsheet Basis	
	LAW	HLW	BBI Standard Analyte*	BBI Supplemental Analyte
Eu-154	6.0E5 (A,B) 4.3E6 (C)	0.052	X	
Eu-155	-	-	X	
Tritium (H-3)	-	6.50E-05	X	
I-129	-	2.90E-07	X	
Nb-93m	-	-	X	
Ni-59	-	-	X	
Ni-63	-	-	X	
Np-237	-	7.40E-05	X	
Pa-231	-	-	X	
Pu-238	-	3.50E-04	X	
Pu-239	-	3.10E-03	X	
Pu-241	-	2.20E-02	X	
Pu-242	-	-	X	
Ra-226	-	-	X	
Ra-228	-	-	X	
Ru-106	-	-	X	
Sb-125	-	3.20E-02	X	

Attachment A-1. DQO Table Values versus BBI.

Table 2. WTP DQO Table 2 Analysis.

	DQO Limit[(a)]		Flowsheet Basis	
	LAW	**HLW**	**BBI Standard Analyte***	**BBI Supplemental Analyte**
Se-79	-	-	X	
Sm-151	-	-	X	
Sn-126	-	1.50E-04	X	
Sn-121m	-	-		
Cs-135	-	-		
Sr-90	4.4E7 (A,B) 8.0E8 (C)	10	X	
Tc-99	7.10E+06	0.015	X	
Th-229	-	-	X	
Th-232	-	-	X	
TRU	4.8E5 (A,B) 3.0E6 (C)	-	X	
U-232	-	-	X	
U-233	-	4.5E-6[(b)]	X	
U-234	-	-	X	
U-235	-	2.50E-07	X	
U236	-	-	X	
U-238	-	-	X	

Attachment A-1. DQO Table Values versus BBI.

Table 2. WTP DQO Table 2 Analysis.

	DQO Limit[(a)]		Flowsheet Basis	
	LAW	HLW	BBI Standard Analyte*	BBI Supplemental Analyte
Y-90	-	-	X	
Zr-93	-	-	X	

(a) Values are upper limits. None of the organics listed in Table 4.2 of the DQO have defined limits.
(b) AY-101/C-101 has a limit of 2.0E-4.

Attachment A-1. DQO Table Values versus BBI.

Table 3. Data Availability in BBI.

Analyte	All Tanks		Double Shell Tanks	
	Count[a]	Percent	Count	Percent
NH_3	16	8.9	3.0	10.7
Aroclors (Total PCB)	179	99.4	28.0	100.0
TOC	177	98.3	28.0	100.0
Ag[b]	91	50.6	20.0	71.4
Al	179	99.4	28.0	100.0
As[b]	72	40.0	18.0	64.3
B[b]	85	47.2	19.0	67.9
Ba[b]	90	50.0	20.0	71.4
Be[b]	84	46.7	20.0	71.4
Bi	175	97.2	28.0	100.0
Br[b]	8	4.4	0.0	0.0
Ca	179	99.4	28.0	100.0
Ce[b]	67	37.2	18.0	64.3
Cd[b]	96	53.3	19.0	67.9
Cl	180	100.0	28.0	100.0
Co[b]	84	46.7	19.0	67.9
TIC as CO_3	179	99.4	28.0	100.0
CN[b]	32	17.8	3.0	10.7
Cr	179	99.4	28.0	100.0
Cs	0	0.0	0.0	0.0
Cu[b]	84	46.7	19.0	67.9
F	178	98.9	28.0	100.0
Fe	179	99.4	28.0	100.0
Hg	169	93.9	26.0	92.9
K	179	99.4	28.0	100.0
La	171	95.0	28.0	100.0
Li[b]	76	42.2	19.0	67.9
Mg[b]	84	46.7	19.0	67.9
Mn	177	98.3	28.0	100.0

Attachment A-1. DQO Table Values versus BBI.

Table 3. Data Availability in BBI.

Analyte	All Tanks		Double Shell Tanks	
	Count[(a)]	Percent	Count	Percent
Mo[(b)]	76	42.2	19.0	67.9
Na	180	100.0	28.0	100.0
Nd[(b)]	66	36.7	19.0	67.9
Ni	179	99.4	28.0	100.0
NO_2	180	100.0	28.0	100.0
NO_3	180	100.0	28.0	100.0
PO_4	180	100.0	28.0	100.0
Pb	178	98.9	28.0	100.0
Pd[(b)]	11	6.1	6.0	21.4
PO_4	180	100.0	28.0	100.0
Pr[(b)]	14	7.8	6.0	21.4
Pu	0	0.0	0.0	0.0
Rb[(b)]	6	3.3	2.0	7.1
Rh[(b)]	13	7.2	7.0	25.0
Ru[(b)]	14	7.8	6.0	21.4
SO_4	179	99.4	28.0	100.0
Sb[(b)]	70	38.9	18.0	64.3
Se[(b)]	65	36.1	17.0	60.7
Si	178	98.9	28.0	100.0
Sn[(b)]	9	5.0	2.0	7.1
SO_4	179	99.4	28.0	100.0
Sr	180	100.0	28.0	100.0
Ta[(b)]	10	5.6	6.0	21.4
Tc	0	0.0	0.0	0.0
Te[(b)]	11	6.1	6.0	21.4
Th[(b)]	178	98.9	28.0	100.0
Ti[(b)]	82	45.6	19.0	67.9
Tl[(b)]	37	20.6	15.0	53.6
TIC as CO_3	179	99.4	28.0	100.0

Attachment A-1. DQO Table Values versus BBI.

Table 3. Data Availability in BBI.

Analyte	All Tanks		Double Shell Tanks	
	Count[a]	Percent	Count	Percent
UTOTAL	180	100.0	28.0	100.0
V[b]	77	42.8	19.0	67.9
W[b]	12	6.7	5.0	17.9
Y[b]	34	18.9	15.0	53.6
Zn[b]	88	48.9	19.0	67.9
Zr	176	97.8	28.0	100.0
^{227}Ac	178	98.9	28.0	100.0
^{241}Am	180	100.0	28.0	100.0
^{243}Am	179	99.4	28.0	100.0
^{137m}Ba	180	100.0	28.0	100.0
^{14}C	178	98.9	28.0	100.0
^{113m}Cd	178	98.9	28.0	100.0
^{242}Cm	179	99.4	28.0	100.0
^{243}Cm	179	99.4	28.0	100.0
^{60}Co	179	99.4	28.0	100.0
^{134}Cs	178	98.9	28.0	100.0
^{137}Cs	180	100.0	28.0	100.0
^{152}Eu	178	98.9	28.0	100.0
^{154}Eu	179	99.4	28.0	100.0
^{155}Eu	179	99.4	28.0	100.0
^{3}H	178	98.9	28.0	100.0
^{129}I	173	96.1	28.0	100.0
^{93m}Nb	170	94.4	28.0	100.0
^{59}Ni	178	98.9	28.0	100.0
^{6}3Ni	178	98.9	28.0	100.0
^{237}Np	178	98.9	28.0	100.0
^{231}Pa	178	98.9	28.0	100.0
^{238}Pu	178	98.9	28.0	100.0
^{239}Pu	178	98.9	28.0	100.0

Attachment A-1. DQO Table Values versus BBI.

Table 3. Data Availability in BBI.

Analyte	All Tanks		Double Shell Tanks	
	Count[(a)]	Percent	Count	Percent
^{241}Pu	178	98.9	28.0	100.0
^{242}Pu	178	98.9	28.0	100.0
^{226}Ra	178	98.9	28.0	100.0
^{228}Ra	178	98.9	28.0	100.0
^{106}Ru	178	98.9	28.0	100.0
^{125}Sb	178	98.9	28.0	100.0
^{79}Se	178	98.9	28.0	100.0
^{151}Sm	178	98.9	28.0	100.0
^{126}Sn	178	98.9	28.0	100.0
^{90}Sr	180	100.0	28.0	100.0
^{99}Tc	178	98.9	28.0	100.0
^{229}Th	178	98.9	28.0	100.0
^{232}Th	178	98.9	28.0	100.0
^{232}U	179	99.4	28.0	100.0
^{233}U	180	100.0	28.0	100.0
^{234}U	179	99.4	28.0	100.0
^{235}U	180	100.0	28.0	100.0
^{236}U	179	99.4	28.0	100.0
^{238}U	180	100.0	28.0	100.0
^{90}Y	180	100.0	28.0	100.0
^{93}Zr	170	94.4	28.0	100.0
Oxalate	177	98.3	28.0	100.0

Note: Total Cs, Pu, and Tc are not tracked, but can be calculated from the radioisotope analysis.

(a) The BBI inventory lists 180 tanks. In addition to the 177 DST/SSTs, BBI contains information on 244-BX, 244-S, and 244-TX.

(b) Supplemental BBI analyte.

APPENDIX B

INTERFACE FLOW PARAMETERS

APPENDIX B

LIST OF TERMS

Abbreviations and Acronyms

BDGRE	buoyant displacement gas release event
CSR	Criticality Safety Representative
DOE	U.S. Department of Energy
DSA	Documented Safety Analysis
DST	double-shell tank
ETF	Effluent Treatment Facility
FCL	feed control list
HLW	high-level waste
HTWOS	Hanford Tank Waste Operations Simulator
IFP	interface flow parameter
IHLW	immobilized high-level waste
ILAW	immobilized low-activity waste
ISARD	Integrated Sampling and Analysis Requirement Document
ISM	Integrated Solubility Model
LERF	Liquid Effluent Retention Facility
LFL	lower flammability limit
LLW	low-level waste
MFPV	melter feed process vessel
NOC	Notice of Construction
ORP	Office of River Protection
PAC	protective action criteria
PCB	polychlorinated biphenyl
PM	particulate matter
PM10	particulate matter 10 micrometers
RCRA	*Resource Conservation and Recovery Act*
RPP	River Protection Project
SST	single-shell tank
TEDF	Treated Effluent Disposal Facility
TOC	total organic carbon
TOE	total operating efficiency
TRU	transuranic
ULD	unit-liter dose
USOF	unit sum of fraction
WAC	waste acceptance criteria
WSPS	waste stream profile sheet
WTP	Waste Treatment and Immobilization Plant

Units

Bq/L	becquerels per liter
Bq/m^2	becquerels per square meter
Btu/h	British thermal units per hour
Ci/L	curies per liter
Ci/m^3	curies per cubic meter
cP	centipoise
DE-Ci	Dose Equivalent Curie
°C	degree Celsius
°F	degree Fahrenheit
dscf	dry standard cubic feet
dscm	dry standard cubic meter
FGE	Fissile Gram Equivalent
ft.	feet
ft^3/day	cubic feet per day
ft/s	foot per second
in.	inch
kg	kilogram
nCi/g	nanocuries per gram
g	gram
g/kg	grams per kilogram
g/L	grams per liter
g/mL	grams per milliliter
gal	gallon
gal/day	gallons per day
gpm	gallons per minute
in.	inch
kg/L	kilograms per liter
kgal	kilogallons
lb	pound
lb/hr	pounds per hour
lbf/in^2	pounds force per square inch
M	molar
mrem/hr	millirem per hour
mR/h	millirads per hour
MTG	metric tons of glass
nCi/g	nanocuries per gram
ng	nanogram
ng/L	nanograms per liter
PE-Ci	Plutonium-239 Equivalent Curie
pCi/L	picocuries per liter
ppm	parts per million
ppmdv	parts per million, dry volume
psi	pounds per square inch

psig	pounds per square inch gauge
Pu-eq	plutonium equivalent
Spg	specific gravity
Sv/L	sieverts per liter
μCi/mL	microcuries per milliliter
μg/L	micrograms per liter
w.g.	water gauge
watt/ft^3	watts per cubic foot
wt %	weight percent

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
	Interface 1a – CH-TRU from T Complex Single-Shell Tanks (SSTs) to Supp. TRU Treatment Facility						
1a-1	Bulk waste density from 1.0 to 1.45 g/mL	RPP-15048, *Procurement Specification for Contact-Handled Transuranic Mixed Waste Packaging Unit and Support Equipment*	Not yet implemented	PNNL-14221, *Assessment of Physical Properties of Transuranic Waste in Hanford Single-Shell Tanks*	Operation	HTWOS liquid density is calculated based on the method documented in RPP-14767, *Hanford Tank Waste Operation Simulator Specific Gravity Model – Derivation of Coefficients and Validation* (RPP-17152, *Hanford Tank Waste Operations Simulator (HTWOS) Version 7.7 Model Design Document*, Section 2.6.1)	
1a-2	Waste viscosity from 1 to 50 centipoise	RPP-15048, *Procurement Specification for Contact-Handled Transuranic Mixed Waste Packaging Unit and Support Equipment*	Not yet implemented	PNNL-14221, *Assessment of Physical Properties of Transuranic Waste in Hanford Single-Shell Tanks*	Operation	Not modeled.	
1a-3	Waste temperature from 50 to 80 °F	RPP-15048, *Procurement Specification for Contact-Handled Transuranic Mixed Waste Packaging Unit and Support Equipment*	Not yet implemented	PNNL-14221, *Assessment of Physical Properties of Transuranic Waste in Hanford Single-Shell Tanks*	Operation	Liquid densities and volumes in HTWOS are calculated at 30 °C (86 °F).	
1a-4	Chemical and radiological properties list in Appendix A of RPP-15048.	RPP-15048, *Procurement Specification for Contact-Handled Transuranic Mixed Waste Packaging Unit and Support Equipment*	Not yet implemented	PNNL-14221, *Assessment of Physical Properties of Transuranic Waste in Hanford Single-Shell Tanks*	Safety, Environmental	The SSTs assumed to provide contact-handled sludge are B-201, B-202, B-203, B-204, T-201, T-202, T-203, T-204, T-111, T-110, and T-104.	
1a-5	Total volume of waste transferred per batch, including in-line dilution and flush, shall be between 800 and 1000 gallons. Up to 10 batches per day.	RPP-15048, *Procurement Specification for Contact-Handled Transuranic Mixed Waste Packaging Unit and Support Equipment*	Not yet implemented	TBD	Operation	Treat a maximum of 8,040 gal of slurry from retrieved TRU tank waste per day. The waste volumes projected to be generated during retrievals are based on the assumed retrieval technology. The assumed rate is based on a 1:1 dilution of the in-situ waste with water during retrieval and a 0.67 TOE.	Total batch volume is based on a 1 to 1 dilution of tank waste and water or effluent.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
1a-6	Waste transfers rate between 60 and 70 gpm at an operating pressure of 175 psig.	RPP-15048, *Procurement Specification for Contact-Handled Transuranic Mixed Waste Packaging Unit and Support Equipment*	Not yet implemented	TBD	Operation	Retrievals are not explicitly modeled. Minimum retrieval durations volumes are imported to the model from SVF-1647, *SVF-1647_Rev_5_Calculation_of_SST_Retrieval_Volumes_and_Durations.xlsx*. See RPP-40545, *Quantitative Assumptions for Single-Shell Tank Waste Retrieval Planning*, for the SVF-1647 underlying assumptions. Three T Farm tank retrieval technologies currently assume hard heel retrievals are needed; however, no additional time for hard heel retrieval is currently modeled. (RPP-17152, *Hanford Tank Waste Operations Simulator (HTWOS) Version 7.7 Model Design Document*, Section 3.3.6)	
	Interface 1b – Supernate for sluicing from Supp. TRU Treatment Facility to T Complex SSTs						
1b-1	Liquid stream generated for return to the SST WRS must meet LERF/ETF WAC (IFPs are similar to those in interface 25).	RPP-15048, *Procurement Specification for Contact-Handled Transuranic Mixed Waste Packaging Unit and Support Equipment*	Not yet implemented	TBD	Operation, Safety, Environmental	Supernate recycles are not modeled in HTWOS. Minimum retrieval durations volumes are imported to the model from SVF-1647, *SVF-1647_Rev_5_Calculation_of_SST_Retrieval_Volumes_and_Durations.xlsx*. See RPP-40545, *Quantitative Assumptions for Single-Shell Tank Waste Retrieval Planning*, for the SVF 1647 underlying assumptions.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
1b-2	Effluent transferred to SST WRS at variable rate up to 70 gpm with an operating pressure of 80 psig and a shut-off head not exceed 120 psig.	RPP-15048, *Procurement Specification for Contact-Handled Transuranic Mixed Waste Packaging Unit and Support Equipment*	Not yet implemented	TBD	Safety	Not modeled.	
1b-3	Up to 350 gallons of effluent per batch of retrieved tank waste.	RPP-15048, *Procurement Specification for Contact-Handled Transuranic Mixed Waste Packaging Unit and Support Equipment*	Not yet implemented	TBD	Operation	Not modeled.	
	Interface 2 – CH-TRU from B Complex SSTs to Supp. TRU Treatment Facility						
2-1 through 2-6	IFPs 1a-1 through 1a-6 are applicable to interface 2.	N/A	N/A	N/A	N/A	N/A	
	Interface 3 – Offgas from Supp. TRU Treatment Facility to Stack						
3-1	Offgas stream shall comply with the non-radioactive airborne emissions requirements contained in WAC 173-400, “General regulations for air pollution sources,” and WAC 173-460, “Controls for new sources of toxic air pollutants,” as implemented by Permit No. 00-05-006, *Hanford Site Air Operating Permit*.	Permit No. 00-05-006, *Hanford Site Air Operating Permit*	Not yet implemented	WAC 173-400, “General regulations for air pollution sources” WAC 173-460, “Controls for new sources of toxic air pollutants”	Environmental	Process splits are based on SVF-1778, *HTWOS_Equipment_Splits Rev 7.xlsm*, and air is emitted through the SUPP-TRU-STACK at 14.7 psi and 77 °F. (RPP-17152, *Hanford Tank Waste Operations Simulator (HTWOS) Version 7.7 Model Design Document*, Section 13.2)	
3-2	Offgas stream shall comply with the radioactive airborne emission requirements contained in WAC 246-247-060 and HNF-IP-0842, Volume 6, Section 1.7, as implemented by Permit No. 00-05-006, *Hanford Site Air Operating Permit*.	Permit No. 00-05-006, *Hanford Site Air Operating Permit*	Not yet implemented	WAC 246-247-060, HNF-IP-0842, Volume 6, Section 1.7	Environmental	Process splits are based on SVF-1778, *HTWOS_Equipment_Splits Rev 7.xlsm*, and air is emitted through the SUPP-TRU-STACK at 14.7 psi and 77 °F. (RPP-17152, *Hanford Tank Waste Operations Simulator (HTWOS) Version 7.7 Model Design Document*, Section 13.2)	
	Interface 4 – Waste Package from Supp. TRU Treatment Facility to Central Waste Complex						

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
4-1	For waste that could form condensate during storage, sufficient sorbent shall be added to the container to sorb any condensate formed.	HNF-EP-0063, *Hanford Site Solid Waste Acceptance Criteria*	Not yet implemented	TBD	Environmental	Not modeled.	
4-2	Dose Equivalent Curie (DE-Ci) limit for a drum is 82.5.	HNF-EP-0063, *Hanford Site Solid Waste Acceptance Criteria*	Not yet implemented	TBD	Safety	The dried CH-TRU waste product is packaged in 55-gal drums containing 620 lb of product per drum.	
4-3	Decay heat limit for storage at the Central Waste Complex is 0.1 watt/ft^3 or 0.73 watts per drum.	HNF-EP-0063, *Hanford Site Solid Waste Acceptance Criteria*	Not yet implemented	TBD	Safety	Not modeled.	
	Interface 5 – Waste Package from Central Waste Complex to WIPP						
5-1	Maximum gross weight for a filled drum is 1,000 lbs.	DOE/WIPP-02-3122, *Waste Acceptance Criteria for the Waste Isolation Pilot Plant*.	Not yet implemented	DOE/WIPP-02-3214, *Remote-Handled TRU Waste Characterization Program Implementation Plan*	Operation	Not modeled.	
5-2	Fissile Gram Equivalent (FGE) Pu-239 plus 2 times the standard deviation must be less than the 200 gram limit for a 55-gallon drum.	DOE/WIPP-02-3122, *Waste Acceptance Criteria for the Waste Isolation Pilot Plant*.	Not yet implemented	TBD	Safety	Not modeled.	
5-3	Waste payload containers shall contain more than 100 nCi/g of alpha-emitting TRU isotopes with half-lives greater than 20 years.	DOE/WIPP-02-3122, *Waste Acceptance Criteria for the Waste Isolation Pilot Plant*.	Not yet implemented	40 CFR Parts 191 and 194	Environmental	Not modeled.	
5-4	Beryllium mass limit ≤ 1% by weight of the waste in 55-gallon drum.	DOE/WIPP-02-3122, *Waste Acceptance Criteria for the Waste Isolation Pilot Plant*.	Not yet implemented	TBD	Safety	Not modeled.	
5-5	Plutonium-239 Equivalent Curies (PE-Ci) limit for a drum in good condition and directly loaded is less than or equal to 80.	DOE/WIPP-02-3122, *Waste Acceptance Criteria for the Waste Isolation Pilot Plant*.	Not yet implemented	TBD	Safety	Not modeled.	
	Interface 6 – Secondary Liquid Waste from Supp. TRU Treatment Facility to LERF/ETF						
6-1	Liquid stream generated to tanker truck must meet LERF/ETF WAC (IFPs are similar to those in interface 25).	RPP-10548, *Procurement Specification for Contact Handled Transuranic Waste Packaging Unit and Support Equipment*	Not yet implemented	HNF-3172, *Liquid Waste Processing Facilities Waste Acceptance Criteria*	Environmental, Safety, Operation	Transfers are modeled as continuous.	
6-2	Wastewater must be compatible with the tanker materials of construction and U.S. Department of Transportation shipping requirements. The information from the profile is compared against the A2 quantities given in 49 *Code of Federal Regulations* (CFR) Part 173.435. The A2 quantities must be less than or equal to one for shipments using Beall, Polar, or Superior tankers. Shipments with an A2 value greater than one will be handled on a case-by-case basis. Compatibility concerns may require flushing of the tanker with process water after the shipment is unloaded	HNF-3172, *Liquid Waste Processing Facilities Waste Acceptance Criteria*	Not yet implemented	49 CFR 173.435, Table of A1 and A2 Values for Radionuclides	Environmental, Safety	Not modeled.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
	Interface 7a – Waste from T Complex SSTs to T Complex WRF						
7a-1	IFP 9a-11 is applicable to interface 7a.	N/A	N/A	N/A	N/A	N/A	
7a-2 through 7a-8	IFPs 9a-13 through 9a-19 are applicable to interface 7a.	N/A	N/A	N/A	N/A	N/A	
7a-9	IFPs 9a-24 is applicable to interface 7a.	N/A	N/A	N/A	N/A	N/A	
7a-10 through 7a-11	IFPs 9a-27 and 9a-28 are applicable to interface 7a.	N/A	N/A	N/A	N/A	N/A	
7a-12 through 7a-14	IFPs 9a-30 and 9a-32 are applicable to interface 7a.	N/A	N/A	N/A	N/A	N/A	
7a-15	T Complex retrieval rates will vary by technology. The currently assumed retrieval technologies and associated rates are: Modified sluicing – in-tank vehicle – 95 gpm Modified sluicing – high PO_4 Eqpt + In-tank vehicle – 95 gpm Mobile arm retrieval system – sluicing – 95 gpm Mobile arm retrieval system – sluicing (High PO_4 Salt) – 95 gpm Mobile arm retrieval system – vacuum – 95 gpm Mobile arm retrieval system – vacuum (High PO_4 Salt) – 95 gpm Modified sluicing in 200-series tanks – 70 gpm	RPP-40545, *Quantitative Assumptions for Single-Shell Tank Waste Retrieval Planning*, Table A.4.3-1	TFC-ENG-CHEM-C-11, "Process Control Plans"	Section A.3 of RPP-40545, *Quantitative Assumptions for Single-Shell Tank Waste Retrieval Planning* RPP-RPT-50506, *MARS-V Technology Phase II Qualification Test Report*	Technical	The retrieval minimum volumes and durations calculated in SVF-1647, *SVF-1647_Rev_5_Calculation_of_SST_Retrieval_Volumes_and_Durations.xlsx*, form the input into the model for the SST retrieval durations and volumes. The SST waste retrieval rates are based on the retrieval technology that is planned for each tank. HTWOS uses an average retrieval rate based on the initial inventory and the minimum retrieval duration. Waste transfer durations are calculated by dividing the total volume being transferred by the transfer rate. There is a 5-day delay between subsequent uses of transfer routes having common components starting after the C Farm retrievals are completed. This accounts for the	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
						closeout of one transfer route and the establishment of another route. There is a 2-week wait period between selecting an SST for retrieval and the beginning of retrieval operations to allow sufficient time for retrieval and route setup.	
	Interface 7b – Supernate Recycle from T Complex WRF to T Complex SSTs						
7b-1 through 7b-5	IFPs 9b-1 through 9b-5 are applicable to interface 7b.	N/A	N/A	N/A	N/A	N/A	
7b-6 through 7b-23	IFPs 9b-7 through 9b-24 are applicable to interface 7b.	N/A	N/A	N/A	N/A	N/A	
7b-24	IFPs 9b-27 is applicable to interface 7b.	N/A	N/A	N/A	N/A	N/A	
7b-25	T Complex WRF to SST transfers are currently restricted to supernate. Retrieval liquids that may be added to the SSTs only following appropriate Ecology approvals pursuant to applicable Hanford Federal Facility Agreement and Consent Order or other enforceable milestones. Retrieval liquids may include the Double-Shell Tank (DST) waste for the purpose of dissolution and to facilitate SST retrieval operations.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*, Section 3.3.3.1	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part V, Closure Unit 4, "SST Part A"	Environmental	Not modeled.	
	Interface 8a – Waste from T Complex WRF to West Area DSTs						
8a-1 through 8a-32	IFPs 9a-1 through 9a-32 are applicable to interface 8a.	N/A	N/A	N/A	N/A	N/A	
8a-33	T Complex waste stream (dangerous waste) codes must be included within the DST Part A permit.	WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 12, "Double-Shell Tank System & 204-AR Waste Unloading Station"	N/A	N/A	Environmental	Not modeled.	
	Interface 8b – Supernate Recycle from West Area DSTs to T Complex WRF						
8b-1	IFP 9b-6 is applicable to interface 8b.	N/A	N/A	N/A	N/A	N/A	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
8b-2	IFP 9b-11 is applicable to interface 8b.	N/A	N/A	N/A	N/A	N/A	
8b-3 through 8b-6	IFPs 9b-14 through 9b-17 are applicable to interface 8b.	N/A	N/A	N/A	N/A	N/A	
8b-7 through 8b-9	IFPs 9b-19 through 9b-21 are applicable to interface 8b.	N/A	N/A	N/A	N/A	N/A	
8b-10	DST waste stream (dangerous waste) codes must be included within the WRF Part A permit.	WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 12, "Double-Shell Tank System & 204-AR Waste Unloading Station"	N/A	N/A	Environmental	Not modeled.	
	Interface 9a – Waste from U Farm SSTs to West Area DSTs						
9a-1	Waste transfers into **Waste Group A tanks IS PROHIBITED** without prior written approval from the U.S. Department of Energy, Office of River Protection (ORP) Manager, River Protection Project Authorization Agreement, 29633-0001 32-ESQ-LT.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	TFC-ENG-CHEM-C-11, "Process Control Plans" TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	RPP-10006, *Methodology and Calculations for the Assignment of Waste Groups for the Large Underground Waste Storage Tanks at the Hanford Site*.	Safety	HTWOS has a DST logic block for Group A tanks known as "Special LAW supernate feeds." This logic block prevents transfers to Group A tanks and mitigates the tanks when appropriate. (RPP-17152, *Hanford Tank Waste Operations Simulator (HTWOS) Version 7.7 Model Design Document*, Section 4.2.1)	RPP-10006 includes both SST and DSTs.
9a-2	Operations that would result in the re-designation of a Waste Group B or C tank as a Waste Group A tank are prohibited without prior written approval from the ORP Manager. Waste tanks must be evaluated using the methodology described in RPP-10006. *Methodology and Calculations for the Assignment of Waste Groups for the Large Underground Waste Storage Tanks at the Hanford Site*, to determine the Waste Group. Evaluate the final state of Waste Group B and C DSTs and SSTs (receiving tanks) prior to waste transfers.	HNF-IP-1266, *Tank Farms Operations Administrative Controls* HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* (Rev. 31)	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments" TFC-ENG-CHEM-C-11, "Process Control Plans"	RPP-10006, *Methodology and Calculations for the Assignment of Waste Groups for the Large Underground Waste Storage Tanks at the Hanford Site*.	Safety	The following simplified proxy limits are used: • The evaporator maximum Spg set point of 1.43 is assumed to prevent future accumulations of salts that might result in classifying a DST as Group A. • Salt accumulations seen when using the ISM are mitigated to prevent the creation of a Group A	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
						tank. When the ISM is used in HTWOS, solid salt precipitation can be seen. The evaporator Spg limit remains at 1.43, but a solids buildup mitigation has been implemented in the tanks affected by solid salt precipitation. This solids buildup mitigation is only applied when the ISM is turned on. The solids buildup mitigation is as follows: • When a tank reaches 70 inches of solids, it is moved to the solids buildup mitigation logic block to prevent any further transfers into the tank that could accumulate additional solids. • The supernatant on top of the solids is decanted to an available tank, which is moved to the solids mitigation decant tanks logic block. • Water is added. • The tank is mixed and solids dissolved. • If the tank is below the solids limit for exiting the solids buildup mitigation, then it can exit. If the tank is not below the solids limit, then water is added and the tank is mixed until the solids level is below the limit. Basis: When using ISM,	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
						the solids buildup mitigation is applied at 70 inches of solids because above this level, the risk of becoming a Group A tank increases, as identified by Operations (email from N. Kirch to K. Pierson October 22, 2013).	
9a-3	The following waste transfers/additions to Waste Group B DSTs require evaluation using the methodology in PNNL-13781 or RPP-RPT-47933 to determine if an induced gas release due to dissolution of solids is sufficient to achieve a flammable gas concentration ~ 100% of the LFL in the receiving DST headspace assuming zero ventilation. • Additions of >20,000 gal of waste… when the ending waste level in the receiving DST is ≤ 422 in. • Additions of >10,000 gal of waste… when the ending waste level in the receiving DST is >422 in. If the evaluation identifies the flammable gas concentration could be ≥100% of the LFL, then ventilations controls will be required for the activity in accordance with HNF-SD-WM-TSR-006, *Tank Farms Technical Safety Requirements* (TSR), LCO 3.4, "DST Induced Gas Release Event Flammable Gas Control."	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* (Rev. 31) HNF-IP-1266, *Tank Farms Operations Administrative Controls*	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	PNNL-13781, *Effects of Globally Waste Disturbing Activities on Gas Generation, Retention, and Release in Hanford Waste Tanks* RPP-RPT-47933, *Flammable Gas Release Rate from Double-Shell Tank Solids Dissolution*	Safety	Not modeled.	
9a-4	If the median buoyancy ratio of the receiving tank following the transfer is greater than or equal to 0.86, notify the Base Operations Process Engineering Manager. The requirement for buoyancy ratio evaluation is based on prudent operation and management of the DSTs to prevent the inadvertent creation of a tank with operational limitations to prevent buoyant displacement gas release event (BDGRE) behavior. A tank buoyancy ratio of 1 or greater requires the volume of supernatant to be controlled to stay outside of potential BDGRE characteristics.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* (Rev. 31)	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	PNNL-13781, *Effects of Globally Waste Disturbing Activities on Gas Generation, Retention, and Release in Hanford Waste Tanks* RPP-RPT-47933, *Flammable Gas Release Rate from Double-Shell Tank Solids Dissolution*	Safety	Not modeled.	The conservative limit of 0.86 is a flag that allows management the opportunity to determine if creating this condition is desirable.
9a-5	The tank headspace flammable gas concentration shall be ≤ 25% of the lower flammability limit (LFL). Evaluate the end state of the receiving tank prior to waste transfers, chemical additions of sodium hydroxide or sodium nitrite for waste chemistry management, and water transfers > 10,000 gallons in DSTs. This evaluation shall verify that the minimum time for the headspace flammable gas concentration to reach 25% of the LFL remains greater than or equal to the established minimum limits. For DST, the time to 25% LFL shall be greater than the surveillance frequency listed in HNF-IP-1266, Table 5.9.1-1 (time limits reproduced below). The TTLFL evaluation shall use the methodology documented in RPP-5926, *Steady-State Flammable Gas Release Rate Calculation and*	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* (Rev. 31) HNF-SD-WM-TRD-007, *Double-Shell Tank System Specification* HNF-IP-1266, *Tank Farms Operations Administrative Controls*	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	HNF-SD-WM-TSR-006, *Tank Farms Technical Safety Requirements* RPP-5926, *Steady State Flammable Gas Release Rate Calculation and Lower Flammability Level Evaluation for Hanford Tank Waste* RPP-8050, *Lower Flammability Limit Calculations for Catch Tanks, DST Annuli, Waste*	Safety	Not modeled.	A hydrogen release of 9.6 ft^3/day accounts for slow, continuing induced gas releases from the dissolution of soluble settled solids.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
	Lower Flammability Level Evaluation for Hanford Tank Waste, which assumes (1) zero ventilation, (2) the addition of 10,000 gallons of water, and (3) a bulk waste temperature increase of 9 °F (for DSTs). If the evaluation indicates that the time for the headspace to reach 25% of the LFL is less than the minimum limit, the transfer/addition is not allowed until the limit is changed to account for the shorter time in accordance with HNF-IP-1266, Section 5.9.1. In addition to the calculated steady-state releases, a hydrogen release of 9.6 ft^3/day shall be included in the TTLFL evaluation. From HNF-IP-1266, Table 5.9.1-1, *DST and SST Time to Lower Flammability Limit* Tank / Surveillance Frequency (days) 241-AN-101 / 9; 241-AN-102 / 9; 241-AN-103 / 9; 241-AN-104 / 9; 241-AN-105 / 9; 241-AN-106 / 9; 241-AN-107 / 9; 241-AP-101 / 10; 241-AP-102 / 10; 241-AP-103 / 10 95; 241-AP-104 / 10; 241-AP-105 / 10; 241-AP-106 / 10; 241-AP-107 / 10; 241-AP-108 / 10; 241-AW-101 / 10; 241-AW-102 / 10; 241-AW-103 / 10; 241-AW-104 / 10; 241-AW-105 / 10; 241-AW-106 / 10; 241-AY-101 / 5; 241-AY-102 / 5; 241-AZ-101 / 5; 241-AZ-102 / 5; 241-SY-101 / 25; 241-SY-102 / 25; 241-SY-103 / 25	RPP-13033, *Tank Farms Documented Safety Analysis*		*Transfer-Associated Structures, and Double-Contained Receiver Tanks in Tank Farms at the Hanford Site*			
9a-6	The end state of the receiving DST shall be evaluated to verify that the minimum time for the flammable gas concentration to reach 25% and 60% of the LFL in the tank annulus as the result of a waste leak. This shall be verified for the following activities: a. Prior to waste transfers to DSTs. b. Prior to large water additions (> 10,000 gallons). c. Prior to chemical additions of sodium hydroxide or sodium nitrite to DSTs for waste chemistry management. The time to LFL analysis shall verify the minimum times for the flammable gas concentration to increase by 25% and 60% of the LFL in the DST annulus headspace remain > 2 1/ 3 days and > 9 days, respectively. The TTLFL evaluation shall use the methodology documented in RPP-8050, *Lower Flammability Limit Calculations for Catch Tanks, DST Annuli, Waste Transfer Associated Structures and Double-Contained Receiver Tanks in Tank Farms at the Hanford Site*, which assumes (1) zero airflow condition, (2) an annulus waste level in equilibrium with the primary tank waste level, (3) waste composition and temperature in the DST primary tank and (4) the addition of 10,000 gallons of water.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* (Rev. 31) HNF-IP-1266, *Tank Farms Operations Administrative Controls*	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	HNF-SD-WM-TSR-006, *Tank Farms Technical Safety Requirements* RPP-5926, *Steady State Flammable Gas Release Rate Calculation and Lower Flammability Level Evaluation for Hanford Tank Waste* RPP-8050, *Lower Flammability Limit Calculations for Catch Tanks, DST Annuli, Waste Transfer-Associated Structures, and Double-Contained Receiver Tanks in Tank Farms at the Hanford Site*	Safety	Not modeled.	
9a-7	Planned waste transfers into DSTs (other than 241-AN-101 and 241-AN-106) that could result in a sludge depth greater than 172 inches (as measured by sludge weight assembly) are prohibited unless the DST remains Waste Group C.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* (Rev. 31) HNF-IP-1266, *Tank Farms Operations Administrative Controls*	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	RPP-RPT-56639, *Interim Assessment for Potential Gas Release Events in Hanford Site Deep Sludge Double-Shell Tank Waste*	Safety	AN-101 and AN-106 currently have additional volume restrictions to prevent a deep sludge gas release event (DSGRE). HTWOS assumes that these restrictions will be lifted in the near term and the sludge and waste volumes are not restricted	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
						to these values.	
9a-8	Waste transfers to DSTs are evaluated to verify that the radiological unit-liter doses (ULDs) are bounded by the assumptions used in the DSA. This verification is performed by evaluating 90Sr/90Y, 137Cs, 239Pu, 240Pu and 241Am using the dose conversion factors provided in HNF-IP-1266, Section 5.9.4. Because these isotopes may only account for 95% of the ULDs, the calculated ULDs shall be divided by 0.95 for comparison to the bounding ULDs (for 242-A and DSTs) provided in HNF-IP-1266, Table 5.9.4-1 and Table 5.9.4-4 (provided below) for the DSTs. From Table 5.9.4.1 in HNF-IP-1266 ULD Offsite Liquid (Sv/L) : ULD Offsite Solid (Sv/L) : ULD Onsite Liquid (Sv/L) : ULD Onsite Solid (Sv/L) 241-AZ-101 1.5 E+03 : 2.9 E+05 : 4.0 E+02 : 2.0 E+05 DSTs 1.5 E+03 : 1.7 E+05 : 1.0 E+03 : 9.0 E+04 From Table 5.9.4-4 in HNF-IP-1266 ULD Offsite Liquid (Sv/L) : ULD Offsite Solid (Sv/L) : ULD Onsite Liquid (Sv/L) : ULD Onsite Solid (Sv/L) DSTs 1.5E+3 : 2.9E+5 : 1.0E+3 : 2.0E+5	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* (Rev. 31) HNF-IP-1266, *Tank Farms Operations Administrative Controls* HNF-SD-WM-TSR-006, *Tank Farms Technical Safety Requirements*, AC 5.9.4, "Waste Characteristics Controls, (AC Key Element)" HNF-SD-WM-TRD-007, *Double-Shell Tank System Specification*	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments" OSD-T-151-00031, *Operating Specifications for Tank Farm Leak Detection and Single-Shell Tank Intrusion Detection* TFC-ENG-CHEM-D-21, "Process Engineering Waste Surveillance Data Review"	RPP-13033, *Tank Farms Documented Safety Analysis* RPP-5924, *Radiological Source Terms for Tank Farms Safety Analysis*	Safety	Not modeled.	To protect assumptions on waste characteristics used to estimate accident consequences by ensuring that unit-liter doses (ULD), unit sum-of-fractions (USOF), and ^{90}Sr and ^{137}Cs concentrations are within the values used in the RPP-13033 safety analysis.
9a-9	Waste transfers to DSTs are evaluated to verify that the toxicological USOFs are bounded by the assumptions used in the DSA. This evaluation is performed by calculating the Protective Action Criteria (PAC)-2 and PAC-3 unit sums of fractions (USOFs) for the solid and liquid phases of the waste stream, using equivalent compounds for the analytes shown in HNF-IP-1266 Table 5.9.4-2 (provided below) and the methodology described in RPP-30604. The complete list of analytes in Table 5.9.4-2 shall be used unless Base Operations Process Engineering approves the use of a substitute list. The calculated total USOFs are compared to the bounding USOFs provided in HNF-IP-1266, Table 5.9.4-1 and 5.9.4-4 (provided below) for the DSTs.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* (Rev. 31) HNF-IP-1266, *Tank Farms Operations Administrative Controls* HNF-SD-WM-TSR-006, *Tank Farms Technical Safety Requirements*, AC 5.9.4, "Waste Characteristics	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments" OSD-T-151-00031, *Operating Specifications for Tank Farm Leak Detection and Single-Shell Tank Intrusion Detection* TFC-ENG-CHEM-D-21, "Process Engineering Waste Surveillance Data Review"	RPP-13033, *Tank Farms Documented Safety Analysis* RPP-30604, *Tank Farms Safety Analyses Chemical Source Term Methodology*	Safety	Not modeled.	To protect assumptions on waste characteristics used to estimate accident consequences by ensuring that unit-liter doses (ULDs), unit sum-of-fractions (USOF), and 90Sr and 137Cs concentrations are within the values used in the RPP-13033 safety analysis.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
	The toxicological USOFs are calculated using an approved spreadsheet. The spreadsheet is documented in SVF-1245, *Waste Compatibility SOF V1.2.xls*, and is described in RPP-31767, *Spreadsheet Description Document for Waste Compatibility SOF V1.2.XLS*. From Table 5.9.4.2 in HNF-IP-1266 Required Liquid Analytes for Toxicological USOF Evaluations Aluminum (Al), Arsenic (As), Beryllium (Be), Bismuth (Bi), Cadmium (Cd), Calcium (Ca), Carbonate (CO_3), Chloride (Cl), Chromium (Cr),Cobalt (Co), Fluoride (F), Hydroxide (OH), Iron (Fe), Lanthanum (La), Lead (Pb), Manganese (Mn), Mercury (Hg), Nickel (Ni), Nitrate (NO_3), Nitrite (NO_2), Phosphate (PO_4), Potassium (K), Rhodium (Rh), Selenium (Se), Silicon (Si), Silver (Ag), Sodium (Na), Strontium (Sr), Sulfate (SO_4), Total Organic Carbon (TOC), Tungsten (W), Uranium (U), Zinc (Zn), Zirconium (Zr) Required Solid Analytes for Toxicological USOF Evaluations Aluminum (Al), Arsenic (As), Beryllium (Be), Bismuth (Bi), Cadmium (Cd), Calcium (Ca), Carbonate (CO_3), Chloride (Cl), Chromium (Cr),Cobalt (Co), Fluoride (F), Hydroxide (OH), Iron (Fe), Lanthanum (La), Lead (Pb), Manganese (Mn), Mercury (Hg), Nickel (Ni), Nitrate (NO_3), Nitrite (NO_2), Palladium (Pd), Phosphate (PO_4), Potassium (K), Selenium (Se), Silicon (Si), Silver (Ag), Sodium (Na), Strontium (Sr), Sulfate (SO_4), Tellurium (Te), Thallium (Tl), Thorium (Th), Tin (Sn), Total Organic Carbon (TOC), Uranium (U), Zirconium (Zr) From Table 5.9.4.1 in HNF-IP-1266 USOF PAC-2 Liquid : USOF PAC-2 Solid : USOF PAC-3 Liquid : USOF PAC-3 Solid 241-AZ-101 4.0 E+08 : 5.0 E+08 : 2.0 E+07 : 6.0 E+07 DSTs 4.0 E+08 : 5.0 E+08 : 2.0 E+07 : 2.5 E+07 From Table 5.9.4-4 in HNF-IP-1266 USOF PAC-2 Liquid : USOF PAC-2 Solid : USOF PAC-3 Liquid : USOF PAC-3 Solid DSTs 4.0E+8 : 5.0E+8 : 1.3E+7 : 6.0E+7	Controls, (AC Key Element)" HNF-SD-WM-TRD-007, *Double-Shell Tank System Specification*					

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
9a-10	Compare the liquid ^{90}Sr and ^{137}Cs concentrations for the waste transfer to the limiting liquid ^{90}Sr and ^{137}Cs concentrations for the applicable waste transfer listed in Table 5.9.4-4 (DST values listed below). Compare the solid ^{90}Sr and ^{137}Cs concentrations for the waste transfer to the limiting solid ^{90}Sr and ^{137}Cs concentrations for the applicable waste transfer listed in Table 5.9.4-4. From Table 5.9.4-4 in HNF-IP-1266 Sr-90 Liquid (Bq/L) : Sr-90 Solid (Bq/L) : Cs-137 Liquid (Bq/L) : Cs-137 Solid (Bq/L) DSTs 3.0E+9 : 3.0E+12 : 7.0E+10 : 7.0E+10	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* (Rev. 31) HNF-IP-1266, *Tank Farms Operations Administrative Controls* HNF-SD-WM-TSR-006, *Tank Farms Technical Safety Requirements*, AC 5.9.4, "Waste Characteristics Controls, (AC Key Element)" HNF-SD-WM-TRD-007, *Double-Shell Tank System Specification*	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments" OSD-T-151-00031, *Operating Specifications for Tank Farm Leak Detection and Single-Shell Tank Intrusion Detection* TFC-ENG-CHEM-D-21, "Process Engineering Waste Surveillance Data Review"	RPP-13033, *Tank Farms Documented Safety Analysis* RPP-5924, *Radiological Source Terms for Tank Farms Safety Analysis*	Safety	Not modeled.	To protect assumptions on waste characteristics used to estimate accident consequences by ensuring that unit-liter doses (ULDs), unit sum-of-fractions (USOF), and ^{90}Sr and ^{137}Cs concentrations are within the values used in the RPP-13033, *Tank Farms Documented Safety Analysis* (DSA) safety analysis.
9a-11	Prior to waste transfer an evaluation shall be performed and documented that identifies any requirements to prevent the formation of waste gel at all times during the waste transfer or chemical addition, and any identified requirements shall be implemented in the waste retrieval or transfer operating procedures for the activities. Waste characteristics to be used in the evaluation are obtained from the best available tank data (e.g., the BBI database). Gels are defined in the tank farms as high viscosity, nonsettling, thixotropic suspensions even though these suspensions are not a gel in the true chemical sense of the word. The primary waste gel of concern for tank farm operations is trisodium phosphate dodecahydrate (Na_3PO_4•$12H_2O$•0.25NaOH). For wastes with an undiluted phosphate, [PO_4^{-3}], concentration of less than or equal to 0.1 M, no specific controls are required to avoid phosphate gelling and further evaluation is not required. If specific controls are required to maintain waste conditions that prevent the precipitation of a gel, Base Operations Process Engineering shall document the controls in the WCA for the waste transfer or chemical addition. The specific controls to be employed to prevent the formation of phosphate gels are provided in TFC-ENG-STD-26, "Waste Transfer, Dilution, and Flushing Requirements."	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* (Rev. 31) HNF-IP-1266, *Tank Farms Operations Administrative Controls* HNF-SD-WM-TSR-006, *Tank Farms Technical Safety Requirements*, AC 5.9.4, "Waste Characteristics Controls" (AC Key Element) TFC-ENG-STD-26, "Waste Transfer, Dilution, and Flushing Requirements"	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments" TFC-ENG-CHEM-C-11, "Process Control Plans" TFC-OPS-OPER-C-49, "Development of Waste Retrieval and Transfer Operating Procedures (Including Water and Chemical Additions)"	RPP-23600, *Phosphate Solubility Technical Basis*	Safety	Not modeled.	
9a-12	Criticality Safety Representative (CSR)/Alternate approval shall be required for waste transfers when the plutonium (Pu-equivalent) inventory in the receiver DST or SST exceeds or will exceed 10 kg. Justification for the approval will be documented as part of the waste compatibility assessment.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* (Rev. 31) HNF-SD-WM-TRD-007, *Double-Shell Tank System Specification*	OSD-T-151-00031, *Operating Specifications for Tank Farm Leak Detection and Single-Shell Tank Intrusion Detection* TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	RPP-7475, *Criticality Safety Evaluation for Hanford Tank Farms Facility*	Safety	Not modeled.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
9a-13	A Waste Stream Profile will be completed to verify waste compatibility prior to transfers into the DST System. The Waste Stream Profile Sheet (WSPS) form can be found in the most current revision of RPP-29002, *Double-Shell Tank System Waste Analysis Plan*.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* (Rev. 31) RPP-29002, *Double-Shell Tank Waste Analysis* Plan	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	WAC 173-303-300, *General Waste Analysis*	Environmental Safety	Not modeled.	
9a-14	Wastes entering the DST system must be categorized according to Reactivity Group (PB94-963603) as a part of the WSPS. The waste in the DST system falls into two reactivity groups: group 10 caustics and group 106 water and mixtures containing water. Source wastes shall be categorized according to Table 3-6 of HNF-SD-WM-OCD-015, which has not been reproduced here, and potential chemical compatibility hazards identified by waste generators. If no potential hazard is identified for mixing of wastes in the identified reactivity groups with the receiver tank waste, the transfer may be allowed. If a potential hazard is identified, a technical justification explaining how the waste may be safely transferred and stored in light of the potential hazard will be required before allowing the transfer.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* (Rev. 31)	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	RPP-29002, *Double-Shell Tank Waste Analysis Plan* PB94-963603, OSWER, 9938.4-03, *Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Wastes: A Guidance Manual*.	Environmental	Not modeled.	
9a-15	Waste cannot be transferred within the DST or SST system if the transfer would cause the receiving tank to exceed the PCB inventory concentration limit of 50 ppm in the solid or 2.9 ppm in the liquid. If a tank is found to exceed the limit, no transfers of incoming waste containing PCBs in excess of the limit will be allowed into that tank. It is allowable to transfer waste with a PCB concentration below the limit into a tank that exceeds the limit.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* (Rev. 31, Section 3.3.2.2)	TFC-ENG-CHEM-C-11, "Process Control Plans" TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	RPP-6623, *Management of The Polychlorinated Biphenyl Inventory In The Double-Shell Tank System*	Environmental	Not modeled.	If no PCB analytical data are available for DST or SST waste, an estimate of 25 ppm for solids and 0.2 ppm for liquids will be used.
9a-16	Waste transfers and chemical additions will be screened against the Feed Control List (FCL) provided in Table A-1 of HNF-SD-WM-OCD-015. The screening will initially review the proposed transfer to determine whether either the Source or the Receiver tank is contained in the FCL. If no tank involved in the transfer/addition is on the FCL, no further evaluation is required. If a tank is contained on the FCL, further evaluation and disposition of the criteria will be required.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* (Rev. 31)	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	Letter CH2M-0304844, "Contract Number DE-AC27-99RL14047; Request for the U.S. Department of Energy, Office of River Protection to Rescind Direction on Configuration Control of Waste Feed Delivery Tank Contents" Letter 04-TPD-024, CTS No: 0400539, "Contract Number DE-AC27-99RL14047; Response to Request for the U.S. Department of Energy, Office of River Protection to Rescind Direction on Configuration Control of Waste Feed Delivery Tank Contents."	Technical	The waste blending and segregation controls in the feed control list will be followed, with the following exceptions and clarifications: • "Blend off high ^{233}U solids" – It is assumed that blending solids from Tanks C-111 and C-112 with the solids from Tank C-104 in Tank AN-101 will successfully mitigate the uranium enrichment issues with the C-104 solids. Other tanks may be used as blend stock, provided the fissile-uranium-to-total-uranium loading	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
						constraint is met; • "Segregate Envelope C" – It is assumed that the strontium and TRU constituents will be removed from the Envelope C waste currently stored in Tanks AN-102 and AN-107 in the DST system rather than in the WTP, at which time segregation is no longer required. • "Segregate waste destined for TRU or low-level waste (LLW) packaging" – It is assumed that only the CH-TRU will be segregated. The remote-handled TRU (RH-TRU) may be commingled with other tank waste and will be fed to WTP. • "Segregate low-cesium SST waste for non-WTP supplemental treatment" – No waste needs to be segregated as low cesium feed. • Enhanced blending of sludge will help reduce the projected mass of HLW glass to meet the consent decree dates for waste treatment and SST retrievals. Blending strategies include: Significant heels in the DSTs and the HLW melter increase incidental blending; delivery of partial batches from the	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
						SST receivers to the HLW Feed Staging Tanks and from the HLW Feed Staging Tanks to the HLW Feed Tanks may optionally be used to provide intentional blending; RH-TRU solids from Tanks AW-103 and AW-105 may be blended with other HLW solids to reduce the zirconium concentration, if possible and beneficial.	
9a-17	For waste streams with ≤ 5% settled solids by volume and a specific gravity Spg ≤ 1.35, no further line plugging evaluation is required.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* (Rev. 31)	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	RPP-5346, *Waste Feed Delivery Transfer System Analysis*	Safety	Not modeled.	
9a-18	Transfer of wastes containing greater than 5 percent by weight insoluble solids shall have a minimum transfer velocity of approximately 6 feet per second (140 gpm in a 3in I.D line), unless calculations have been performed to establish the critical deposition velocity of the waste and show that a lower transfer velocity exceeds the critical deposition velocity. Critical velocity shall be determined using the methodology of Oroskar and Turian for waste transfers containing greater than 5 weight percent insoluble solids.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* (Rev. 31) TFC-ENG-STD-26, "Waste Transfer, Dilution, and Flushing Requirements"	TFC-ENG-CHEM-C-11, "Process Control Plans" TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	HNF-2728, *Flow Velocity Analysis for Avoidance of Solids Deposition during Transport of Hanford Tank Waste Slurries* Oroskar and Turian, "The Critical Velocity in Pipeline Flow of Slurries", AICHE Journal 1980 (attached to RPP-19221, *Critical Flow Velocity Calculations for Waste Transfer Piping*) RPP-19221, *Critical Flow Velocity Calculations for Waste Transfer Piping* RPP-5346, *Waste Feed Delivery Transfer System Analysis* RPP-9805, *Values of Particle Size, Particle Density, and Slurry Viscosity to Use in Waste Feed Delivery Transfer System Analysis*	Safety Technical	Wastes retrieved from the SSTs will be retrieved at the capacity of the retrieval system as defined by the minimum durations when DST space is available.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
9a-19	Transfer of waste streams with an aluminum concentration> 0.5 M require further evaluation for the potential precipitation of aluminum as gibbsite at low hydroxide concentrations. This evaluation is performed in accordance with TFC-ENG-STD-26, "Waste Transfer, Dilution, and Flushing Requirements.".	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* (Rev. 31) TFC-ENG-STD-26, "Waste Transfer, Dilution, and Flushing Requirements"	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	HNF-2728, *Flow Velocity Analysis for Avoidance of Solids Deposition during Transport of Hanford Tank Waste Slurries* ARH-ST-133, *Vapor-Liquid-Solid Phase Equilibria of Radioactive Sodium Salt Wastes at Hanford* RPP-17247, *Dilution and Flushing Requirements to Avoid Solids Precipitation and Deposition During Tank Waste Transfers*	Technical	Not modeled.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
9a-20	The final state of source and receiver DSTs must be evaluated for compliance with tank chemistry controls. DST waste chemistry limits are given in HNF-SD-WM-OCD-015 Table 3-9 (reproduced here). The evaluation shall include an assumed water addition of 10,000 gallons. The receipt or transfer of waste that does not meet chemistry control limits can occur only if the receiving DST will remain within specification limits after the transfer or as part of actions for the mitigation of out-of-specification waste. Table 3-9. Waste Chemistry Limits for All DST's Waste except 241-AN-102, AN-106, AN-107, AY-101, and AY-102 Interstitial Liquids FOR $[NO_3^-]$ RANGE : FOR WASTE TEMPERATURE (T) RANGE : Variable $[NO_3^-] \le 1.0M$: $T < 167$ °F : $0.010M \le [OH^-] \le 8.0M$ $[NO_3^-] \le 1.0M$: 167 °F $\le T \le$ 212 °F : $0.010M \le [OH^-] \le 5.0M$ $[NO_3^-] \le 1.0M$: $T > 212$ °F : $0.010M \le [OH^-] < 4.0M$ $[NO_3^-] \le 1.0M$: $T < 167$ °F, 167 °F $\le T \le$ 212 °F, $T > 212$ °F : $0.011M \le [NO_2^-] \le 5.5M$ $[NO_3^-] \le 1.0M$:$T < 167$ °F, 167 °F $\le T \le$ 212 °F, $T > 212$ °F : $[NO_3]/([OH^-] + [NO_2^-]) < 2.5M$ $1.0M < [NO_3^-] \le 3.0M$: $T < 167$ °F : $0.1([NO_3^-]) \le [OH^-] < 10M$ $1.0M < [NO_3^-] \le 3.0M$: 167 °F $\le T \le$ 212 °F : $0.1([NO_3^-]) \le [OH^-] < 10M$ $1.0M < [NO_3^-] \le 3.0M$: $T > 212$ °F : $0.1([NO_3^-]) \le [OH^-] < 4.0M$ $1.0M < [NO_3^-] \le 3.0M$: $T < 167$ °F, 167 °F $\le T \le$ 212 °F, $T > 212$ °F : $[OH^-] + [NO_2^-] \ge 0.4([NO_3^-])$ $[NO_3^-] > 3.0M$: $T < 167$ °F : $0.3M \le [OH^-] < 10M$ $[NO_3^-] > 3.0M$: 167 °F $\le T \le$ 212 °F : $0.3M \le [OH^-] < 10M$ $[NO_3^-] > 3.0M$: $T > 212$ °F : $0.3M \le [OH^-] < 4.0M$ $[NO_3^-] > 3.0M$: $T < 167$ °F, 167 °F $\le T \le$ 212 °F, $T > 212$ °F : $[OH^-] + [NO_2^-] \ge 1.2M$ $[NO_3^-] > 3.0M$: $T < 167$ °F, 167 °F $\le T \le$ 212 °F, $T > 212$ °F : $[NO_3^-] \le 5.5M$	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* (Rev. 31) OSD-T-151-00007, *Operating Specifications for the Double-Shell Storage Tanks*	RPP-13639, *Caustic Limits Report* TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	RPP-7795, *Technical Basis for Chemistry Control Program* SD-WM-TI-150, *Technical Basis for Waste Tank Corrosion Specification* TWRS-PP-94-025, *Sludge Washing Materials Study: The Behavior of Carbon Steel in a Dilute Waste Environment*	Technical	During retrieval of waste from the SSTs to the DST system, sodium hydroxide and sodium nitrite will be added as needed so that the as-retrieved liquid phase composition satisfies the DST waste chemistry limits given in Table 3-2 of HNF-SD-WM-OCD-015 (Rev. 24), *Tank Waste Transfer Compatibility Program*. Issue: The model does not currently check nor correct for $[OH^-]$ or $[NO_2^-]$ concentrations that are greater than their upper limits, nor for $[NO_3^-]$ concentrations greater than 5.5 M.	The concentration limits for all DST waste except 241-AN-102, 241-AN-106, 241-AN-107, 241-AY-101, and 241-AY-102 interstitial liquid are based on past corrosion studies and are intended to limit the rate of uniform corrosion to less than or equal to the design basis of the tanks of 1 mil per year (0.001 inches per year) and to minimize the potential for pitting and stress corrosion cracking.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
9a-21	Prior to waste transfers into DSTs, the Tank Operations Contractor shall evaluate the end state of the receiving tank to verify that at least one of the following criteria is met. a. Total tank heat load is < 58,000 Btu/h. OR b. Non-convective layer height is < 12 in. OR c. Supernatant depth is < 39 in. OR d. The non-condensable gas generation rate at saturation in the non-convective layer is sufficiently low, such that the ratio of vertical void fraction profile to the neutral buoyant void fraction is < 1.0. OR e. For AN-106 only, the supernatant temperature is <177 ºF.	OSD-T-151-00007, *Operating Specifications for the Double-Shell Storage Tanks* HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	OSD-T-151-00007, *Operating Specifications for the Double-Shell Storage Tanks* TFC-ENG-CHEM-P-13, “Tank Waste Compatibility Assessments”	Temperature readings for AN-106 are taken weekly to comply with AC 5.9.1 (HNF-IP-1266) RPP-RPT-28968, *Hanford Double-Shell Tank Thermal and Seismic Project – Summary of Combined Thermal and Operating Loads with Seismic Analysis* RPP-RPT-32237, *Hanford Double-Shell Tank Thermal and Seismic Project – Increased Liquid Level Analysis for 241-AP Tank Farms*	Technical	Not modeled.	
9a-22	The DST system shall not exceed Maximum hydrostatic loads and Maximum Bulk Specific Gravities internal to existing DSTs within the limits specified in OSD-T-151-00007, Section 1.2, Table 1.2.1 (listed below). Table 1.2.1, Maximum Bulk Specific Gravity, from OSD-T-151-00007 Tanks / Maximum Hydrostatic Load (in. w.g.) / Maximum Bulk Specific Gravity 241 – AN, AW, SY / 717 / 1.7 241 – AP / 841 / 1.83 241 – AY, AZ / 655 / 1.77	HNF-SD-WM-TRD-007, *Double-Shell Tank System Specification* OSD-T-151-00007, *Operating Specifications for the Double-Shell Storage Tanks* HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	OSD-T-151-00031, *Operating Specifications for Tank Farm Leak Detection and Single-Shell Tank Intrusion Detection* TFC-ENG-CHEM-D-21, “Process Engineering Waste Surveillance Data Review” TFC-ENG-CHEM-P-13, “Tank Waste Compatibility Assessments”	RPP-11801, *Analysis of Record Summary for Double-Shell Tanks*, Section 4.0 For 241-AP, Section 7.0 of RPP-RPT-32237 concludes that a waste height of 460 in at Maximum Specific Gravity of 1.83 does not reveal structural deficiencies of the DST. For 241-AN, AW, and SY the waste Maximum Specific Gravity of 1.7 is based on the values presented in Table 7-4 of RPP-RPT-28967 *Hanford Double-Shell Tank Thermal and Seismic Project – Buckling Evaluation Methods and Results for the Primary Tanks*, and conclusions presented in Section 8 of RPP-RPT-28967. For 241-AY and AZ, the waste Maximum Specific Gravity of 1.77 is based on the values presented in Table 7-7 of RPP-RPT-28967 and conclusions presented in Section 8 of RPP-RPT-28967.	Technical	No hydrostatic loads calculations but transfers based off known planning.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
9a-23	Concentrated wastes shall be diluted to a specific gravity less than 1.35 prior to transfer unless: 1) Laboratory testing or other evaluation of the waste composition indicates that the waste may be safely pumped at a higher specific gravity without risk of precipitation/gelling in the transfer line or on mixing and/or cooling in the receiver tank, and/or 2) Specific process controls are in place to avoid or mitigate the risk of line plugging.	TFC-ENG-STD-26, “Waste Transfer, Dilution, and Flushing Requirements” HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	TFC-ENG-CHEM-C-11, “Process Control Plans” TFC-ENG-CHEM-P-13, “Tank Waste Compatibility Assessments”	RPP-5346, *Waste Feed Delivery Transfer System Analysis* ARH-ST-133, *Vapor-Liquid-Solid Phase Equilibria of Radioactive Sodium Salt Wastes at Hanford* HNF-2728, *Flow Velocity Analysis for Avoidance of Solids Deposition during Transport of Hanford Tank Waste Slurries* RPP-17247, *Dilution and Flushing Requirements to Avoid Solids Precipitation and Deposition During Tank Waste Transfers* RPP-9805, *Values of Particle Size, Particle Density, and Slurry Viscosity to Use in Waste Feed Delivery Transfer System Analysis*	Technical	Not modeled.	
9a-24	Prior to tank-to-tank waste transfers, SST retrievals, waste transfers to and from the 242-A Evaporator, and the receipt of waste from the 222-S Laboratory, a waste compatibility assessment is prepared in accordance with TFC-ENG-CHEM-P-13. The DST System shall only receive waste that meets waste acceptance criteria in accordance with the DST System Waste Analysis Plan and the Tank Farms Waste Transfer Compatibility Program.	HNF-IP-1266, *Tank Farms Operations Administrative Controls*, 5.9.5 (3.B.3) WAC 173-303-395, “Other General Requirements” WAC 173-303-640, “Tank Systems” HNF-SD-WM-TRD-007, *Double-Shell Tank System Specification*	RPP-29002, *Double Shell Tank Waste Analysis Plan* TFC-ENG-CHEM-P-13, “Tank Waste Compatibility Assessments” OSD-T-151-00031, *Operating Specifications for Tank Farm Leak Detection and Single-Shell Tank Intrusion Detection*	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* WAC 173-303, “Dangerous Waste Regulations” RPP-29002, *Waste Analysis Plan*	Environmental Safety	Not modeled.	
9a-25	Liquid levels, maximum authorized limit/normal operating limit shall be limited to 422/416 inches in all 241-AN and 241-SY Farm tanks along with 241-AP-102, 104, 106, 107 and 241-AW-101, 103-106. Liquid levels shall be limited to 458/454 inches in tanks 241-AP-101, 103, 105 and 108. Liquid levels shall be limited to 422/409 in 241-AW-102. Liquid levels shall be limited to 370/364 inches in all 241-AY and 241-AZ Tanks. Note that liquid levels are subject to change based upon mission needs in accordance with ORP-11242. Changes to liquid levels will be addressed in the latest version of DST operating specification.	HNF-SD-WM-TRD-007, *Double-Shell Tank System Specification* OSD-T-151-00007, *Operating Specifications for the Double-Shell Storage Tanks*	OSD-T-151-00031, *Operating Specifications for Tank Farm Leak Detection and Single-Shell Tank Intrusion Detection* TFC-ENG-CHEM-D-21, “Process Engineering Waste Surveillance Data Review”	OSD-T-151-00007, *Operating Specifications for the Double-Shell Storage Tanks*, Appendix A lists the Basis for these limits. ORP-11242, *River Protection Project System Plan* RPP-11801, *Analysis or Record Summary for Double-Shell Tanks*	Technical	HTWOS has max capacity for the tanks.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
9a-26	The DST system shall maintain waste temperatures in each DST within the design limits and per the methodology specified in OSD-T-151-00007 Section 1.4, Tables 1.4.1, 1.4.2-1, and 1.4.2-2 (all reproduced below). Table 1.4.1 Maximum Temperature for Waste, Steel, and Concrete Tanks / Max Temperature for Waste and Steel (°F) / Max Temperature for Concrete (°F) 241-AN, AW / 350 / Dome: 160, Wall: 236 241-AP / 210 / Dome: 135, Wall: 236 241-AY, AZ / 260 / Dome: 160, Wall: 350 241-SY / 250 / Dome: 160, Wall: 250	HNF-SD-WM-TRD-007, *Double-Shell Tank System Specification* OSD-T-151-00007, *Operating Specifications for the Double-Shell Storage Tanks*	OSD-T-151-00031, *Operating Specifications for Tank Farm Leak Detection and Single-Shell Tank Intrusion Detection* TFC-ENG-CHEM-D-21, "Process Engineering Waste Surveillance Data Review"	OSD-T-151-00007, *Operating Specifications for the Double-Shell Storage Tanks*, Appendix A – OSD Technical Basis	Technical	Not modeled.	
9a-27	Sodium hydroxide and sodium nitrite shall be added during retrieval of waste from SSTs, as needed, so that the as-retrieved liquid phase composition satisfies the DST waste chemistry limits listed in IFP 9a-20.	HNF-SD-WM-TRD-007, *Double-Shell Tank System Specification*	OSD-T-151-00031, *Operating Specifications for Tank Farm Leak Detection and Single-Shell Tank Intrusion Detection* TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*, Section 3.5.2.1	Technical	During retrieval of waste from the SSTs to the DST system, sodium hydroxide and sodium nitrite will be added as needed so that the as-retrieved liquid phase composition satisfies the DST waste chemistry limits given in Table 3-2 of HNF-SD-WM-OCD-015, *Tank Waste Transfer Compatibility Program*. Issue: The model does not currently check nor correct for [OH^-] or [NO_2^-] concentrations that are greater than their upper limits, nor for [NO_3^-] concentrations greater than 5.5 M.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
9a-28	For wastes with phosphate (PO_4^{-3}) concentrations greater than 0.10 M, these specific controls shall be employed to prevent the formation of phosphate gels: 1. The undiluted phosphate concentration of the source waste(s), the initial receiver tank waste and the final receiver tank waste shall be evaluated. 2. For wastes with either an initial or final phosphate concentration greater than 0.1 M or which are planned to be concentrated above 0.1 M, further evaluation of the waste behavior is required prior to transfer. This evaluation shall be conducted in accordance with TFC-ENG-STD-26, “Dilution and Flushing Requirements,” to ensure that unacceptable or unexpected precipitation and/or gelling of the waste does not occur either during transfer, on evaporation and cooling, or on mixing with the waste in the receiver tank. This evaluation will involve review of the waste solubility under all anticipated conditions. 3. In evaluating a transfer, care should be taken to watch for situations in which an intermediate composition during the transfer may exceed the solubility limit whereas the final composition may be below the solubility limit. This situation may arise with multiple source wastes being transferred into the same receiver tank. 4. Limits/controls established for the waste transfer shall consider uncertainties in the solubility data used. 5. If the anticipated waste composition during retrieval and transfer will exceed the established phosphate solubility limit, the waste shall be diluted prior to transfer to ensure the waste composition remains below the solubility limit at all times.	HNF-SD-WM-TRD-007, *Double-Shell Tank System Specification* HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	OSD-T-151-00031, *Operating Specifications for Tank Farm Leak Detection and Single-Shell Tank Intrusion Detection* TFC-ENG-CHEM-P-13, “Tank Waste Compatibility Assessments”	RPP-23600, *Phosphate Solubility Technical Basis*	Technical	Not modeled.	
9a-29	A gas release event evaluation shall be performed and documented for the following waste transfers into DSTs. • Transfers of > 20,000 gal of waste when the resulting waste level in the receiving DST will be ≤ 422 in. • Transfers of > 10,000 gal of waste when the resulting waste level in the receiving DST will be > 422 in. The evaluation shall determine if an induced gas release due to the dissolution of soluble settled solids in the receiving DST is sufficient to achieve a flammable gas concentration of 100% of the LFL in the tank headspace assuming zero ventilation. If a flammable gas concentration of 100% of the LFL can be achieved, LCO 3.4, “DST Induced Gas Release Event Flammable Gas Control,” shall be implemented during the water addition, chemical addition, or waste transfer.	HNF-SD-WM-TSR-006, *Tank Farms Technical Safety Requirements*, Specific Administrative Control (SAC) 5.8.1, “DST Induced Gas Release Event Evaluation and Limiting Control for Operations (LCO) 3.4, DST Induced Gas Release Event Flammable Gas Control” HNF-IP-1266, *Tank Farms Operations Administrative Controls*	TFC-ENG-CHEM-P-13, “Tank Waste Compatibility Assessments” TFC-OPS-OPER-C-49, “Development of Waste Retrieval and Transfer Operating Procedures (Including Water and Chemical Additions)”	PNNL-13781, *Effects of Globally Waste-Disturbing Activities on Gas Generation, Retention, and Release in Hanford Waste Tanks* RPP-13033, *Tank Farms DSA*	Safety	Not modeled.	See RPP-13033, *Tank Farms Documented Safety Analysis*, Chapter 4.0, “Safety Structures, Systems, and Components,” Section 4.5.3, “DST Induced Gas Release Event Flammable Gas Controls,” for additional information.
9a-30	X/Pu of incoming waste containing more than 0.001 g/L Pu-eq where the total g Pu-eq in the transfer is 50 g or less the sum sub-critical mass fractions > 1	CPS-T-149-00012, “Criticality Prevention Specification”	TFC-ENG-CHEM-C-11, “Process Control Plans”	RPP-7475, *Criticality Safety Evaluation for Hanford Tank Farms Facility*	Safety	Not modeled.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
9a-31	X/Pu of incoming waste containing more than 0.001 g/L Pu-eq where the total g Pu-eq in the transfer is more than 50 g the sum sub-critical mass fractions > 2	CPS-T-149-00012, "Criticality Prevention Specification"	TFC-ENG-CHEM-C-11, "Process Control Plans"	RPP-7475, *Criticality Safety Evaluation for Hanford Tank Farms Facility*	Safety	Not modeled.	
9a-32	Maximum bulk fissile material concentration in any DCRT, DST or SST: [Pu-eq] < 2.6 g/L	CPS-T-149-00012, "Criticality Prevention Specification"	TFC-ENG-CHEM-C-11, "Process Control Plans"	RPP-7475, *Criticality Safety Evaluation for Hanford Tank Farms Facility*	Safety	Not modeled.	
9a-33	U Farm retrieval rates will vary by technology. The currently assumed retrieval technologies and associated rates are: Modified sluicing – in-tank vehicle – 95 gpm Modified sluicing – high PO_4 Eqpt + In-tank vehicle – 95 gpm Mobile arm retrieval system – vacuum – 95 gpm Modified sluicing in 200-series tanks – 70 gpm	RPP-40545, *Quantitative Assumptions for Single-Shell Tank Waste Retrieval Planning*, Table A.4.3-1	TFC-ENG-CHEM-C-11, "Process Control Plans"	RPP-40545, *Quantitative Assumptions for Single-Shell Tank Waste Retrieval Planning*, Section A.3 RPP-RPT-50506, *MARS-V Technology Phase II Qualification Test Report*	Technical	The retrieval minimum volumes and durations calculated in SVF-1647, *SVF-1647_Rev_5_Calculation_of_SST_Retrieval_Volumes_and_Durations.xlsx*, form the input into the model for the SST retrieval durations and volumes. The SST waste retrieval rates are based on the retrieval technology that is planned for each tank. HTWOS uses an average retrieval rate based on the initial inventory and the minimum retrieval duration. Waste transfer durations are calculated by dividing the total volume being transferred by the transfer rate. There is a 5-day delay between subsequent uses of transfer routes having common components starting after the C Farm retrievals are completed. This accounts for the closeout of one transfer route and the establishment of another route. There is a 2-week wait period between selecting an SST for retrieval and the beginning of retrieval operations to allow sufficient time for retrieval and route setup.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
	Interface 9b – Supernate Recycle from West Area DSTs to U Farm SSTs						
9b-1	Operations that would result in the re-designation of a Waste Group B or C tank as a Waste Group A tank are prohibited without prior written approval from the ORP Manager.	HNF-IP-1266, *Tank Farm Operations Administrative Controls*, Section 5.A.1 HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments" TFC-ENG-CHEM-C-11, "Process Control Plans"	RPP-10006, *Methodology and Calculations for the Assignment of Waste Groups for the Large Underground Waste Storage Tanks at the Hanford Site*	Safety	Not modeled.	
9b-2	Chemical additions to a Waste Group C 100-Series SST that would result in re-designation as a Waste Group B tank (Chemical additions to 100-series SSTs that are Waste Group B have not been evaluated and are not authorized in DSA) are prohibited.	HNF-IP-1266, *Tank Farm Operations Administrative Controls*, Section 5.A.1 HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments" TFC-ENG-CHEM-C-11, "Process Control Plans"	RPP-10006, *Methodology and Calculations for the Assignment of Waste Groups for the Large Underground Waste Storage Tanks at the Hanford Site*	Safety	Not modeled.	
9b-3	Waste tanks must be evaluated using the methodology described in RPP-10006 to determine the Waste Group. Evaluate the final state of Waste Group B and C DSTs and SSTs (receiving tanks) prior to waste transfers.	HNF-IP-1266, *Tank Farm Operations Administrative Controls*, Section 5.A.1 HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments" TFC-ENG-CHEM-C-11, "Process Control Plans"	RPP-10006, *Methodology and Calculations for the Assignment of Waste Groups for the Large Underground Waste Storage Tanks at the Hanford Site*	Safety	Not modeled.	
9b-4	Evaluate the final state of Waste Group B and C DSTs and SSTs prior to large water additions (> 10,000 gallons in DSTs or 100-series SSTs and > 1,000 gallons in 200-series SSTs).	HNF-IP-1266, *Tank Farm Operations Administrative Controls*, Section 5.A.1 HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments" TFC-ENG-CHEM-C-11, "Process Control Plans"	RPP-10006, *Methodology and Calculations for the Assignment of Waste Groups for the Large Underground Waste Storage Tanks at the Hanford Site*	Safety	Not modeled.	
9b-5	Evaluate the final state of Waste Group C 100-series SSTs prior to chemical additions of sodium hydroxide to support waste retrieval. (Note: Chemical additions to Waste Group B SSTs or to 200-series SSTs have not been evaluated in the DSA and are not authorized.)	HNF-IP-1266, *Tank Farm Operations Administrative Controls*, Section 5.A.1 HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments" TFC-ENG-CHEM-C-11, "Process Control Plans"	RPP-10006, *Methodology and Calculations for the Assignment of Waste Groups for the Large Underground Waste Storage Tanks at the Hanford Site*	Safety	Not modeled.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
9b-6	If a transfer from a Waste Group B DST could uncover solids in the tank, the transfer shall be evaluated using the methodology in PNNL-13781, to determine if an induced gas release due to uncovering solids is sufficient to achieve a flammable gas concentration of 100% of the LFL in the sending DST headspace assuming zero ventilation. If the waste transfer could uncover solids in the sending DST and the engineering evaluation identifies that the flammable gas concentration could be ~ 100% of the LFL, the volume of liquid waste transferred from the sending DST shall be limited to a volume that prevents achieving 100% of the LFL in the tank headspace. The potential to uncover solids is determined by the remaining supernate volume following the evaluated transfer. Conservative minimum limits of 40 in. for tank 241-A W-106 and 20 in. for all other DSTs are used to screen transfers. The limits are based on operating experience and on the typically observed differences in solids level measurement data points. Transfers from Tank 241-AZ-101 that could uncover solids in the tank are not allowed.	HNF-IP-1266, *Tank Farm Operations Administrative Controls* HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	PNNL-13781, *Effects of Globally Waste Disturbing Activities on Gas Generation, Retention, and Release in Hanford Waste Tanks*	Safety	Not modeled.	
9b-7	The tank headspace flammable gas concentration shall be ≤ 25% of the lower flammability limit (LFL). Evaluate the end state of the receiving tank prior to waste transfers, water transfers > 10,000 gallons in 100 series SSTs and > 1,000 gallons in 200 series SSTs, and prior to chemical additions of sodium hydroxide to 100 series SSTs to support waste retrieval. This evaluation shall verify that the minimum time for the headspace flammable gas concentration to reach 25% of the LFL remains greater than or equal to the established minimum limits. For SST, the time to 25% LFL shall be greater than the surveillance frequency listed in HNF-IP-1266, Table 5.9.1-2 (time limits reproduced below). The TTLFL evaluation shall use the methodology documented in RPP-5926, *Steady-State Flammable Gas Release Rate Calculation and Lower Flammability Level Evaluation for Hanford Tank Waste*, which assumes (1) zero airflow condition, (2) the addition of 10,000 gallons of water (1,000 gallons for 200-series SSTS), and (3) a conservative initial waste temperature (plus 6 °F to account for instrument error). If the evaluation indicates that the time for the headspace to reach 25% of the LFL is less than the minimum limit, the transfer/addition is not allowed until the limit is changed to account for the shorter time in accordance with HNF-IP-1266, Section 5.9.1. In addition to the calculated steady-state releases, a hydrogen release of 9.6 ft^3/day shall be included in the TTLFL evaluation. From HNF-IP-1266, Table 5.9.1-2. SST Surveillance Frequency Tank / Surveillance Frequency (days) 241-B-203 / 30; 241-B-204 / 30; 241-C-102 / 121; 241-T-201 / 121; 241-BY-110 / 182; 241-T-203 / 182; 241-T-204 / 182; 241-U-103 / 182; Other SSTs / 365.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* HNF-SD-WM-TRD-007, *Double-Shell Tank System Specification* HNF-IP-1266, *Tank Farm Operations Administrative Controls* RPP-13033, *Tank Farms Documented Safety Analysis*	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	HNF-SD-WM-TSR-006, *Tank Farms Technical Safety Requirements* RPP-5926, *Steady State Flammable Gas Release Rate Calculation and Lower Flammability Level Evaluation for Hanford Tank Waste* RPP-8050, *Lower Flammability Limit Calculations for Catch Tanks, DST Annuli, Waste Transfer-Associated Structures, and Double-Contained Receiver Tanks in Tank Farms at the Hanford Site*	Safety	Not modeled.	A hydrogen release of 9.6 ft^3/day accounts for slow, continuing induced gas releases from the dissolution of soluble settled solids.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
9b-8	Waste transfers to SSTs are evaluated to verify that the radiological ULDs are bounded by the assumptions used in the DSA. This verification is performed by evaluating 90Sr/90Y, 137Cs, 239Pu, 240Pu and 241Am using the dose conversion factors provided in HNF-IP-1266, Section 5.9.4. Because these isotopes may only account for 95% of the ULDs, the calculated ULDs shall be divided by 0.95 for comparison to the bounding ULDs provided in HNF-IP-1266, Table 5.9.4-1 and Table 5.9.4-4 (provided below) for the SSTs. From Table 5.9.4.1 in HNF-IP-1266 ULD Offsite Liquid (Sv/L) : ULD Offsite Solid (Sv/L) : ULD Onsite Liquid (Sv/L) : ULD Onsite Solid (Sv/L) 241-C-200 SSTs 1.7 E+05 : 1.7 E+05 : 1.0 E+03 : 1.3 E+05 SSTs 1.5 E+03 : 1.7 E+05 : 1.0 E+03 : 1.3 E+05 From Table 5.9.4-4 in HNF-IP-1266 ULD Offsite Liquid (Sv/L) : ULD Offsite Solid (Sv/L) : ULD Onsite Liquid (Sv/L) : ULD Onsite Solid (Sv/L) SSTs 1.5E+3 : 2.9E+5 : 1.0E+3 : 2.0E+5	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* HNF-IP-1266, *Tank Farm Operations Administrative Controls* HNF-SD-WM-TSR-006, *Tank Farms Technical Safety Requirements*, AC 5.9.4, "Waste Characteristics Controls" HNF-SD-WM-TRD-007, *Double-Shell Tank System Specification*	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	RPP-13033, *Tank Farms Documented Safety Analysis* RPP-5924, *Radiological Source Terms for Tank Farms Safety Analysis*	Safety	Not modeled.	To protect assumptions on waste characteristics used to estimate accident consequences by ensuring that unit-liter doses (ULD), unit sum-of-fractions (USOF), and ^{90}Sr and ^{137}Cs concentrations are within the values used in the RPP-13033, *Tank Farms Documented Safety Analysis* (DSA) safety analysis.
9b-9	Waste transfers to SSTs are evaluated to verify that the toxicological USOFs are bounded by the assumptions used in the DSA. This evaluation is performed by calculating the Protective Action Criteria (PAC)-2 and PAC-3 USOFs for the solid and liquid phases of the waste stream, using equivalent compounds for the analytes shown in HNF-IP-1266, Table 5.9.4-2 (provided below) and the methodology described in RPP-30604. The complete list of analytes in Table 5.9.4-2 shall be used unless Base Operations Process Engineering approves the use of a substitute list. The calculated total USOFs are compared to the bounding USOFs provided in HNF-IP-1266, Table 5.9.4-1 and 5.9.4-4 (provided below) for the SSTs. The toxicological USOFs are calculated using an approved spreadsheet. The spreadsheet is documented in SVF-1245, *Waste Compatibility SOF V1.2.xls*, and is described in RPP-31767, *Spreadsheet Description Document for Waste Compatibility SOF V1.2.XLS*. From Table 5.9.4.2 in HNF-IP-1266 Required Liquid Analytes for Toxicological USOF Evaluations Aluminum (Al), Arsenic (As), Beryllium (Be), Bismuth (Bi), Cadmium (Cd), Calcium (Ca), Carbonate (CO_3), Chloride (Cl), Chromium (Cr),Cobalt (Co), Fluoride (F), Hydroxide (OH), Iron (Fe), Lanthanum (La), Lead (Pb), Manganese (Mn), Mercury (Hg), Nickel (Ni), Nitrate (NO3), Nitrite (NO2), Phosphate (PO_4), Potassium (K), Rhodium (Rh), Selenium (Se), Silicon (Si), Silver (Ag), Sodium (Na), Strontium (Sr), Sulfate (SO_4), Total Organic Carbon (TOC), Tungsten (W), Uranium (U), Zinc (Zn), Zirconium (Zr) Required Solid Analytes for Toxicological USOF Evaluations	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* HNF-IP-1266, *Tank Farm Operations Administrative Controls* HNF-SD-WM-TSR-006, *Tank Farms Technical Safety Requirements*, AC 5.9.4, "Waste Characteristics Controls" HNF-SD-WM-TRD-007, *Double-Shell Tank System Specification*	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	RPP-13033, *Tank Farms Documented Safety Analysis* RPP-30604, *Tank Farms Safety Analyses Chemical Source Term Methodology*	Safety	Not modeled.	To protect assumptions on waste characteristics used to estimate accident consequences by ensuring that unit-liter doses (ULD), unit sum-of-fractions (USOF), and ^{90}Sr and ^{137}Cs concentrations are within the values used in the RPP-13033, *Tank Farms Documented Safety Analysis* (DSA) safety analysis.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
	Aluminum (Al), Arsenic (As), Beryllium (Be), Bismuth (Bi), Cadmium (Cd), Calcium (Ca), Carbonate (CO3), Chloride (Cl), Chromium (Cr),Cobalt (Co), Fluoride (F), Hydroxide (OH), Iron (Fe), Lanthanum (La), Lead (Pb), Manganese (Mn), Mercury (Hg), Nickel (Ni), Nitrate (NO3), Nitrite (NO2), Palladium (Pd), Phosphate (PO_4), Potassium (K), Selenium (Se), Silicon (Si), Silver (Ag), Sodium (Na), Strontium (Sr), Sulfate (SO_4), Tellurium (Te), Thallium (Tl), Thorium (Th), Tin (Sn), Total Organic Carbon (TOC), Uranium (U), Zirconium (Zr) From Table 5.9.4.1 in HNF-IP-1266 USOF PAC-2 Liquid : USOF PAC-2 Solid : USOF PAC-3 Liquid : USOF PAC-3 Solid 241-C-200 SSTs 4.0 E+08 : 5.0 E+08 : 2.0 E+07 : 8.0 E+07 SSTs 4.0 E+08 : 5.0 E+08 : 2.0 E+07 : 6.0 E+07 From Table 5.9.4-4 in HNF-IP-1266 USOF PAC-2 Liquid : USOF PAC-2 Solid : USOF PAC-3 Liquid : USOF PAC-3 Solid SSTs 4.0E+8 : 5.0E+8 : 1.3E+7 : 6.0E+7						
9b-10	Compare the liquid ^{90}Sr and ^{137}Cs concentrations for the waste transfer to the limiting liquid ^{90}Sr and ^{137}Cs concentrations for the applicable waste transfer listed in Table 5.9.4-4 (SST values listed below). Compare the solid ^{90}Sr and ^{137}Cs concentrations for the waste transfer to the limiting solid ^{90}Sr and ^{137}Cs concentrations for the applicable waste transfer listed in Table 5.9.4-4. From Table 5.9.4-4 in HNF-IP-1266 Sr-90 Liquid (Bq/L) : Sr-90 Solid (Bq/L) : Cs-137 Liquid (Bq/L) : Cs-137 Solid (Bq/L) SSTs 3.0E+9 : 3.0E+12 : 7.0E+10 : 7.05E+10	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* HNF-IP-1266, *Tank Farm Operations Administrative Controls* HNF-SD-WM-TSR-006, *Tank Farms Technical Safety Requirements*, AC 5.9.4, "Waste Characteristics Controls" HNF-SD-WM-TRD-007, *Double-Shell Tank System Specification*	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	RPP-13033, *Tank Farms Documented Safety Analysis* RPP-5924, *Radiological Source Terms for Tank Farms Safety Analysis*	Safety	Not modeled.	To protect assumptions on waste characteristics used to estimate accident consequences by ensuring that unit-liter doses (ULD), unit sum-of-fractions (USOF), and ^{90}Sr and ^{137}Cs concentrations are within the values used in the RPP-13033, *Tank Farms Documented Safety Analysis* (DSA) safety analysis.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
9b-11	Prior to waste transfer an evaluation shall be performed and documented that identifies any requirements to prevent the formation of waste gel at all times during the waste transfer or chemical addition, and any identified requirements shall be implemented in the waste retrieval or transfer operating procedures for the activities. Waste characteristics to be used in the evaluation are obtained from the best available tank data (e.g., the BBI database). Gels are defined in the tank farms as high viscosity, nonsettling, thixotropic suspensions even though these suspensions are not a gel in the true chemical sense of the word. The primary waste gel of concern for tank farm operations is trisodium phosphate dodecahydrate (Na_3PO_4•$12H_2O$•0.25NaOH). For wastes with an undiluted phosphate, [$P0_4^{-3}$], concentration of less than or equal to 0.1 M, no specific controls are required to avoid phosphate gelling and further evaluation is not required. If specific controls are required to maintain waste conditions that prevent the precipitation of a gel, Base Operations Process Engineering shall document the controls in the WCA for the waste transfer or chemical addition. The specific controls to be employed to prevent the formation of phosphate gels are provided in TFC-ENG-STD-26.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* HNF-IP-1266, *Tank Farm Operations Administrative Controls* HNF-SD-WM-TSR-006, *Tank Farms Technical Safety Requirements*, AC 5.9.4, "Waste Characteristics Controls" TFC-ENG-STD-26, "Waste Transfer, Dilution, and Flushing Requirements"	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments" TFC-ENG-CHEM-C-11, "Process Control Plans" TFC-OPS-OPER-C-49, "Development of Waste Retrieval and Transfer Operating Procedures (Including Water and Chemical Additions)"	RPP-23600, *Phosphate Solubility Technical Basis*	Safety	Not modeled.	
9b-12	Criticality Safety Representative (CSR)/Alternate approval shall be required for waste transfers when the plutonium (Pu-equivalent) inventory in the receiver DST or SST exceeds or will exceed 10 kg. Justification for the approval will be documented as part of the waste compatibility assessment.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* HNF-SD-WM-TRD-007, *Double-Shell Tank System Specification*	OSD-T-151-00031, *Operating Specifications for Tank Farm Leak Detection and Single-Shell Tank Intrusion Detection* TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	RPP-7475, *Criticality Safety Evaluation for Hanford Tank Farms Facility*	Safety	Not modeled.	
9b-13	Waste cannot be transferred within the DST or SST system if the transfer would cause the receiving tank to exceed the PCB inventory concentration limit of 50 ppm in the solid or 2.9 ppm in the liquid. If a tank is found to exceed the limit, no transfers of incoming waste containing PCBs in excess of the limit will be allowed into that tank. It is allowable to transfer waste with a PCB concentration below the limit into a tank that exceeds the limit.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	TFC-ENG-CHEM-C-11, "Process Control Plans" TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	RPP-6623, *Management of The Polychlorinated Biphenyl Inventory In The Double-Shell Tank System*	Technical	Not modeled.	If no PCB analytical data are available for DST or SST waste, an estimate of 25 ppm for solids and 0.2 ppm for liquids will be used.
9b-14	Waste transfers and chemical additions will be screened against the Feed Control List (FCL) provided in Table A-1 of HNF-SD-WM-OCD-015. The screening will initially review the proposed transfer to determine whether either the Source or the Receiver tank is contained on the FCL. If no tank involved in the transfer/addition is on the FCL, no further evaluation is required. If a tank is contained on the FCL, further evaluation and disposition of the criteria will be required.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	Letter CH2M-0304844, "Contract Number DE-AC27-99RL14047; Request for the U.S. Department of Energy, Office of River Protection to Rescind Direction on Configuration Control of Waste Feed Delivery Tank Contents" Letter 04-TPD-024, CTS No. 0400539, "Contract Number DE-AC27-99RL14047; Response to Request for the	Technical	The waste blending and segregation controls in the feed control list will be followed, with the following exceptions and clarifications: • "Blend off high 233U solids" – It is assumed that blending solids from Tanks C-111 and C-112 with the solids from Tank C-104 in	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
				U.S. Department of Energy, Office of River Protection to Rescind Direction on Configuration Control of Waste Feed Delivery Tank Contents."		Tank AN-101 will successfully mitigate the uranium enrichment issues with the C-104 solids. Other tanks may be used as blend stock, provided the fissile-uranium-to-total-uranium loading constraint is met. • "Segregate Envelope C" – It is assumed that the strontium and TRU constituents will be removed from the Envelope C waste currently stored in Tanks AN-102 and AN-107 in the DST system rather than in the WTP, at which time segregation is no longer required. • "Segregate waste destined for TRU or low-level waste (LLW) packaging" – It is assumed that only the CH-TRU will be segregated. The remote-handled TRU (RH-TRU) may be commingled with other tank waste and will be fed to WTP. • "Segregate low-cesium SST waste for non-WTP supplemental treatment" – No waste needs to be segregated as low cesium feed. Enhanced blending of sludge will help reduce the projected mass of HLW glass to meet the consent decree dates for	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
						waste treatment and SST retrievals. Blending strategies include: Significant heels in the DSTs and the HLW melter increase incidental blending; delivery of partial batches from the SST receivers to the HLW Feed Staging Tanks and from the HLW Feed Staging Tanks to the HLW Feed Tanks may optionally be used to provide intentional blending; RH-TRU solids from Tanks AW-103 and AW-105 may be blended with other HLW solids to reduce the zirconium concentration, if possible and beneficial.	
9b-15	For waste streams with ≤ 5% settled solids by volume and a specific gravity Spg ≤ 1.35, no further line plugging evaluation is required.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	RPP-5346, *Waste Feed Delivery Transfer System Analysis*	Safety	Not modeled.	
9b-16	Transfer of wastes containing greater than 5 percent by weight insoluble solids shall have a minimum transfer velocity of approximately 6 feet per second (140 gpm in a 3in I.D line), unless calculations have been performed to establish the critical deposition velocity of the waste and show that a lower transfer velocity exceeds the critical deposition velocity. Critical velocity shall be determined using the methodology of Oroskar and Turian for waste transfers containing greater than 5 weight percent insoluble solids.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* TFC-ENG-STD-26, "Waste Transfer, Dilution, and Flushing Requirements"	TFC-ENG-CHEM-C-11, "Process Control Plans" TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	HNF-2728, *Flow Velocity Analysis for Avoidance of Solids Deposition during Transport of Hanford Tank Waste Slurries* Oroskar and Turian, "The Critical Velocity in Pipeline Flow of Slurries," AICHE Journal 1980 (attached to RPP-19221, *Critical Flow Velocity Calculations for Waste Transfer Piping*) RPP-19221, *Critical Flow Velocity Calculations for Waste Transfer Piping* RPP-5346, *Waste Feed Delivery Transfer System Analysis* RPP-9805, *Values of Particle Size, Particle Density, and*	Safety/ Technical	Waste retrieved from the SSTs will be retrieved at the capacity of the retrieval system as defined by the minimum durations when DST space is available	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
				Slurry Viscosity to Use in Waste Feed Delivery Transfer System Analysis			
9b-17	Transfer of waste streams with an aluminum concentration> 0.5 M requires further evaluation for the potential precipitation of aluminum as gibbsite at low hydroxide concentrations. This evaluation is performed in accordance with TFC-ENG-STD-26, "Waste Transfer, Dilution, and Flushing Requirements."	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* TFC-ENG-STD-26, "Waste Transfer, Dilution, and Flushing Requirements"	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	HNF-2728, *Flow Velocity Analysis for Avoidance of Solids Deposition during Transport of Hanford Tank Waste Slurries* ARH-ST-133, *Vapor-Liquid-Solid Phase Equilibria of Radioactive Sodium Salt Wastes at Hanford* RPP-17247, *Dilution and Flushing Requirements to Avoid Solids Precipitation and Deposition During Tank Waste Transfers*	Technical	Not modeled.	
9b-18	Prior to waste transfers into SSTs, the Tank Operations Contractor shall evaluate the end state of the receiving tank to verify that at least one of the following criteria is met. a. Total tank heat load is < 58,000 Btu/h. OR b. Non-convective layer height is < 12 in. OR c. Supernatant depth is < 39 in. OR d. The non-condensable gas generation rate at saturation in the non-convective layer is sufficiently low, such that the ratio of vertical void fraction profile to the neutral buoyant void fraction is < 1.0. OR e. For AN-106 only, the supernatant temperature is <177ºF.	OSD-T-151-00007, *Operating Specifications for the Double-Shell Storage Tanks* HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	OSD-T-151-00007, *Operating Specifications for the Double-Shell Storage Tanks* TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	Temperature readings for AN-106 are taken weekly to comply with AC 5.9.1 (HNF-IP-1266, *Tank Farm Operations Administrative Controls*) RPP-RPT-28968, *Hanford Double-Shell Tank Thermal and Seismic Project – Summary of Combined Thermal and Operating Loads with Seismic Analysis* RPP-RPT-32237, *Hanford Double-Shell Tank Thermal and Seismic Project – Increased Liquid Level Analysis for 241-AP Tank Farms*	Technical	Not modeled.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
9b-19	Concentrated wastes shall be diluted to a specific gravity less than 1.35 prior to transfer unless: 1) Laboratory testing or other evaluation of the waste composition indicates that the waste may be safely pumped at a higher specific gravity without risk of precipitation/gelling in the transfer line or on mixing and/or cooling in the receiver tank, and/or 2) Specific process controls are in place to avoid or mitigate the risk of line plugging.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* TFC-ENG-STD-26, “Waste Transfer, Dilution, and Flushing Requirements”	TFC-ENG-CHEM-C-11, “Process Control Plans” TFC-ENG-CHEM-P-13, “Tank Waste Compatibility Assessments”	RPP-5346, *Waste Feed Delivery Transfer System Analysis* ARH-ST-133, *Vapor-Liquid-Solid Phase Equilibria of Radioactive Sodium Salt Wastes at Hanford* HNF-2728, *Flow Velocity Analysis for Avoidance of Solids Deposition during Transport of Hanford Tank Waste Slurries* RPP-17247, *Dilution and Flushing Requirements to Avoid Solids Precipitation and Deposition During Tank Waste Transfers* RPP-9805, *Values of Particle Size, Particle Density, and Slurry Viscosity to Use in Waste Feed Delivery Transfer System Analysis*	Technical	Not modeled.	
9b-20	Prior to tank-to-tank waste transfers, SST retrievals, waste transfers to and from the 242-A Evaporator, and the receipt of waste from the 222-S Laboratory, a waste compatibility assessment is prepared in accordance with TFC-ENG-CHEM-P-13, “Tank Waste Compatibility Assessments.”	HNF-IP-1266, *Tank Farm Operations Administrative Controls*, AC 5.9.5 (3.B.3) WAC 173-303-395, “Other General Requirements” WAC 173-303-640, “Tank Systems” HNF-SD-WM-TRD-007, *Double-Shell Tank System Specification*	RPP-29002, *Double Shell Tank Waste Analysis Plan* TFC-ENG-CHEM-P-13, “Tank Waste Compatibility Assessments” OSD-T-151-00031, *Operating Specifications for Tank Farm Leak Detection and Single Shell Tank (SST) Intrusion Detection*	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* WAC 173-303, “Dangerous Waste Regulations” RPP-29002, *Waste Analysis Plan*	Environmental Safety	Not modeled.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
9b-21	For wastes with phosphate (PO_4^{-3}) concentrations greater than 0.10 M, these specific controls shall be employed to prevent the formation of phosphate gels: 1. The undiluted phosphate concentration of the source waste(s), the initial receiver tank waste and the final receiver tank waste shall be evaluated. 2. For wastes with either an initial or final phosphate concentration greater than 0.1 M or which are planned to be concentrated above 0.1 M, further evaluation of the waste behavior is required prior to transfer. This evaluation shall be conducted in accordance with TFC-ENG-STD-26, “Dilution and Flushing Requirements,” to ensure that unacceptable or unexpected precipitation and/or gelling of the waste does not occur either during transfer, on evaporation and cooling, or on mixing with the waste in the receiver tank. This evaluation will involve review of the waste solubility under all anticipated conditions. 3. In evaluating a transfer, care should be taken to watch for situations in which an intermediate composition during the transfer may exceed the solubility limit whereas the final composition may be below the solubility limit. This situation may arise with multiple source wastes being transferred into the same receiver tank. 4. Limits/controls established for the waste transfer shall consider uncertainties in the solubility data used. 5. If the anticipated waste composition during retrieval and transfer will exceed the established phosphate solubility limit, the waste shall be diluted prior to transfer to ensure the waste composition remains below the solubility limit at all times.	HNF-SD-WM-TRD-007, *Double-Shell Tank System Specification* HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	OSD-T-151-00031, *Operating Specifications for Tank Farm Leak Detection and Single Shell Tank (SST) Intrusion Detection* TFC-ENG-CHEM-P-13, “Tank Waste Compatibility Assessments”	RPP-23600, *Phosphate Solubility Technical Basis*	Technical	Not modeled.	
9b-22	X/Pu of incoming waste containing more than 0.001 g/L Pu-eq where the total g Pu-eq in the transfer is 50 g or less the sum sub-critical mass fractions > 1	CPS-T-149-00012, “Criticality Prevention Specification”	TFC-ENG-CHEM-C-11, “Process Control Plans”	RPP-7475, *Criticality Safety Evaluation for Hanford Tank Farms Facility*	Safety	Not modeled.	
9b-23	X/Pu of incoming waste containing more than 0.001 g/L Pu-eq where the total g Pu-eq in the transfer is more than 50 g the sum sub-critical mass fractions > 2	CPS-T-149-00012, “Criticality Prevention Specification”	TFC-ENG-CHEM-C-11, “Process Control Plans”	RPP-7475, *Criticality Safety Evaluation for Hanford Tank Farms Facility*	Safety	Not modeled.	
9b-24	Maximum bulk fissile material concentration in any DCRT, DST or SST: [Pu-eq] < 2.6 g/L	CPS-T-149-00012, “Criticality Prevention Specification”	TFC-ENG-CHEM-C-11, “Process Control Plans”	RPP-7475, *Criticality Safety Evaluation for Hanford Tank Farms Facility*	Safety	Not modeled.	
9b-25	Concrete Maximum 280 °F for waste Maximum 250 °F for dome Maximum change 20 °F per day Note: Can be modified on a case-by-case basis by a process memo, which includes an approved engineering evaluation, for special operations such as retrieval and closure	OSD-T-151-00031, *Operating Specifications for Tank Farm Leak Detection and Single Shell Tank (SST) Intrusion Detection*	Replaceable thermocouple trees are installed through risers to measure waste temperatures in tanks	SD-RE-TI-012, *Single-Shell Waste Tank Load Sensitivity Study*, page 18 RPP-11051, *Technical Basis Document for Single-Shell Tank Operating Specifications*	Technical	Not modeled.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
9b-26	The DST System shall adjust supernatant properties to be provided for SST Retrieval in accordance with Waste Chemistry Limits in Table 1.5.1-1, and Table 1.5.1-2 of OSD-T-151-00007. (See IFP 9a-22 for table values.)	HNF-SD-WM-TRD-007, *Double-Shell Tank System Specification*	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	RPP-7795, *Technical Basis for the Chemistry Control Program* RPP-PLAN-40145, *Single-Shell Tank Waste Retrieval Plan* Single-Shell Tank System Part A Permit	Technical	Motive fluid for retrievals is not modeled.	
9b-27	Supernate flow rates will vary by technology. Supernate is supplied at a rate such that a minimum velocity of 6 ft/s will be maintained in the transfer line (per TFC-ENG-STD-26). The typical supply rate in C-Farm has been 100 gpm.	TFC-ENG-STD-26, "Waste Transfer, Dilution, and Flushing Requirements"	TFC-ENG-CHEM-C-11, "Process Control Plans"	See pump AN01A-WTP-024 for an example of a typical slurry pump.	Technical	Not modeled.	
	Interface 10a – Waste from S Complex SSTs to West Area DSTs						
10a-1 through 10a-32	IFPs 9a-1 through 9a-32 are applicable to interface 10a.	N/A	N/A	N/A	N/A	N/A	
10a-33	S and SX Farm retrieval rates will vary by technology. The currently assumed retrieval technologies and associated rates are: Modified sluicing – in-tank vehicle – 95 gpm Mobile arm retrieval system – vacuum – 95 gpm Mobile arm retrieval system – sluicing – 95 gpm Mobile arm retrieval system – sluicing (High PO_4 Salt) – 95 gpm	RPP-40545, *Quantitative Assumptions for Single-Shell Tank Waste Retrieval Planning, Table A.4.3-1*	TFC-ENG-CHEM-C-11, "Process Control Plans"	RPP-40545, *Quantitative Assumptions for Single-Shell Tank Waste Retrieval Planning,* Section A.3 RPP-RPT-50506, *MARS-V Technology Phase II Qualification Test Report*	Technical	The retrieval minimum volumes and durations calculated in SVF-1647, *SVF-1647_Rev_5_Calculation_of_SST_Retrieval_Volumes_and_Durations.xlsx*, form the input into the model for the SST retrieval durations and volumes. The SST waste retrieval rates are based on the retrieval technology that is planned for each tank. HTWOS uses an average retrieval rate based on the initial inventory and the minimum retrieval duration. Waste transfer durations are calculated by dividing the total volume being transferred by the transfer rate. There is a 5-day delay between subsequent uses of transfer routes having common components starting after the C Farm retrievals are completed.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
						This accounts for the closeout of one transfer route and the establishment of another route. There is a 2-week wait period between selecting an SST for retrieval and the beginning of retrieval operations to allow sufficient time for retrieval and route setup.	
	Interface 10b – Supernate Recycle from West Area DSTs to S Complex SSTs						
10b-1 through 10b-27	IFPs 9b-1 through 9b-27 are applicable to interface 10b.	N/A	N/A	N/A	N/A	N/A	
	Interface 11 – Waste Samples from SSTs and DSTs to 222-S Lab						
11-1	(Paraphrased) Administrative Control 5.2.3: The Material at Risk limit for 222-S must be less than the derived radioactive material inventory of 39.11 DE-Ci (DSA, Table 3-1).	HNF-14733, *222-S Laboratory Technical Safety Requirements*	HNF-SD-CP-MA-002, *222-S Laboratory Radiological Inventory Control Program*	HNF-12125, *222-S Laboratory Documented Safety Analysis*, Section 2.5.5.2	Safety	Not modeled.	222-S currently operates as a category 3 facility but is capable of operating as a category 2. This limit sets the operating limits and prevents operating up to category 2 levels.
11-2	(Paraphrased) The 222-S Facility limit is 225g of TRU.	HNF-12125, *222-S Laboratory Documented Safety Analysis*, Section 2.5.5.2	HNF-SD-CP-MA-002, *222-S Laboratory Radiological Inventory Control Program*	HNF-12125, *222-S Laboratory Documented Safety Analysis*, Section 2.5.5.2	Safety	Not modeled.	Assumes 20-yr aged, 12% Pu-240 equivalent, minimum critical mass is 530g to sustain a nuclear chain reaction under ideal conditions. Very conservative.
11-3	The fissionable material inventory will not exceed 225g of plutonium equivalence.	HNF-12125, *222-S Laboratory Documented Safety Analysis*, Section 2.5.5.2	HNF-SD-CP-MA-002, *222-S Laboratory Radiological Inventory Control Program*	HNF-12125, *222-S Laboratory Documented Safety Analysis*, Section 2.5.5.2	Safety	Not modeled.	
11-4	The nuclear material inventory (at 222-S) will be restricted such that the total facility inventory remains below the Category 2 threshold quantities listed in DOE-STD-1027-92 (and provided in HNF-12125, Table 3-7)	HNF-12125, *222-S Laboratory Documented Safety Analysis*, Table 3-7	HNF-SD-CP-MA-002, *222-S Laboratory Radiological Inventory Control Program*	HNF-12125, *222-S Laboratory Documented Safety Analysis*	Safety	Not modeled.	
11-5	Waste Acceptance Criteria for the 222-S TSD container storage units are included in Appendix 1 of ATS-310, Section 6.4	ATS-310, "222-S Laboratory Complex Waste Management Program," Section 6.4	ATS-LO-100-107, "222-S Laboratory Hot Cell Cubicle Housekeeping and Waste Management"	WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 8, "222-S Part A Permit"	Environmental	Not modeled.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
11-6	(Paraphrased) Minimum information required to receive waste into the 222-S TSD unit contains four elements: (1) ensure waste can be managed pursuant to the Part A Form, (2) ensure the waste is not a prohibited waste, (3) determine if the waste is an ignitable, reactive, or incompatible waste as defined in WAC 173-303-040, and (4) treatment and/or disposal characterization information when mixed waste is destined for the 219-S Tank System.	RPP-29498, *Waste Analysis Plan for the 222-S Dangerous and Mixed Waste Treatment, Storage, and Disposal Unit*	ATS-LO-090-101, "Sample Receiving and Custodianship"	ATS-MP-1032, "222-S Laboratory Quality Assurance Project Plan," Chapter 6 ATL-MP-1011, "ATL Quality Assurance Project Plan for 222-S Laboratory," Section 6.3 DOE/RL-96-68, *Hanford Analytical Services Quality Assurance Requirements Documents* (HASQARD), Volume 4, Section 3.3 Permit No. 00-05-006 , *Hanford Site Air Operating Permit* HNF-14733, *222-S Laboratory Technical Safety Requirements*, (TSR) 5.4.1	Environmental	Not modeled.	
	Interface 12 – Offgas from 222-S Lab to Stack (Release to Environment)						
12-1	The total abated emission limit for this Notice of Construction (NOC) is limited to 1.02E-03 mrem/year to the Maximally Exposed Individual (WAC 246-247-040(5)). The total limit on the Potential-To-Emit for this NOC is limited to 3.00E+00 mrem/year to the Maximally Exposed Individual (WAC 246-247-030(21)).	Letter AIR 13-306, "License to Operate the 222-S Laboratory (Replaced NOC ID 831) (NOC 881; EU 254)"	ATS-310, "Management of Gaseous Effluents," Section 6.2	WAC 246-247-040(5), "General Standards" WAC 246-247-030(21), "Definition" RPP-16922, *Environmental Specification Requirements*, Sections 2 and 8	Environmental	Not modeled.	Main Stack 296-S-21 requires continuous radionuclide monitoring Sr-90, Cs-137, and Pu-239. Why not for Am-241?
12-2	The Annual Possession Quantity is limited to Am-241 (6.76E1 Curies/year), Sr-90 (9.0E3 Curies/year), Cs-137 (3.16E3 Curies/year), and Pu-239 (6.85E1 Curies/year) and these radionuclides are identified in AIR 13-306.	Letter AIR 13-306, "License to Operate the 222-S Laboratory (Replaced NOC ID 831) (NOC 881; EU 254)"	ATS-310, "222-S Laboratory Complex Waste Management Program," Section 6.4	WAC 246-247-040(5), "General Standards" WAC 246-247-030(21), "Definition" RPP-16922, *Environmental Specification Requirements*, Sections 2 and 8	Environmental	Not modeled.	
	Interface 13 – Wastewater from 222-S Lab to West Area DSTs						
13-1	Discharges to Tanks 101 and 104 shall be controlled such that solids in Tank 102 do not exceed 0.5 percent solids by weight.	ATS-310, "222-S Laboratory Complex Waste Management Program," Section 6.4	ATS-LO-100-107, "222-S Laboratory Hot Cell Cubicle Housekeeping and Waste Management"	40 CFR 761, "PCB Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions"	Environmental	Not modeled.	
13-2	Wastes may not be accepted into the 219-S Tank System, which will result in exceedance of the process design capacity, as specified in the 222-S Part	ATS-310, "222-S Laboratory Complex Waste Management Program," Section 6.4	None Found	40 CFR 761, "PCB Manufacturing, Processing, Distribution in Commerce, and	Environmental	Approximately 5 kgal of liquid waste from the 222-S Laboratory will be	The 219-S Tank System contains four tanks: Tank 101 (15,000 liters),

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
	A Permit. The limits are: 219-S Tank System Storage: 37,200 liters 219-S Tank System Treatment: 780 liters/day This capacity may be exceeded on any given day but shall not be exceeded over any quarter.			Use Prohibitions" WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 8, "222-S Part A Permit"		received annually until WTP startup. The annual waste volume received from the 222-S Laboratory will increase to 10 kgal after WTP startup and remain at that annual volume until waste processing is complete. The 222-S Laboratory waste will be received into the 200 West Area DST system and will be accompanied by a water flush, whose volume is equal to 22% of the received waste volume (RPP-17152, *Hanford Tank Waste Operations Simulator (HTWOS) Version 7.7 Model Design Document*, Section 4.3.13). Currently the model only accounts for this waste through 2044, which is approximately when the 200 West DSTs are closed. Inventory estimates for this interface are provided in RPP-33715, *Double- and Single-Shell Tank Inventory Input to the HWTOS Model-2007 Update*.	Tank 102 (15,000 liters), Tank 103 (6,000 liters), and Tank 104 (7,200 liters). Tank 103 has been cleaned and isolated, and is out of service. The maximum process design capacity for tank storage is 37,200 liters (9672 gallons). The process design capacity during tank treatment is 780 liters per day. This capacity may be exceeded on any given day but shall not be exceeded over any quarter. Compliance is based on quarterly volumes.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
13-3	Waste Acceptance Criteria for the 222-S 219-S Tank System are included in Appendix 2 of ATS-310, Section 6.4	ATS-310, "222-S Laboratory Complex Waste Management Program," Section 6.4	ATS-MP-1011, "222-S Laboratory 219-S Tank 102 Sampling and Analysis Plan" ATS-LO-100-162, "222-S Laboratory Sample and Treat Liquid Wastes in 219-S Tank 102"	WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 8, *"*222-S Part A Permit" RPP-29498, *Waste Analysis Plan for the 222-S Dangerous and Mixed Waste Treatment, Storage, and Disposal Unit* RPP-29002, *Double-Shell Tank Waste Analysis Plan* RPP-10726, *Requirements for Discharge from Non-Tank Farm Waste Generators into the Double-Shell Tank System*	Safety Environmental	Not modeled.	It is unclear how these waste designations limit any sample processing at 222-S. Clearly organic containing waste is severally limited. These acceptance criteria only impact waste into 219-S Tank System.
13-4	No materials detrimental to 304 stainless steel are allowed in the liquid waste without prior neutralization or thorough flushing of the lines after transfer (to 219-S).	HNF-12125, *222-S Laboratory Documented Safety Analysis*, Section 2.5.2.2	ATS-LO-100-177, "222-S Laboratory Transfer 219-S Tank 102 Liquid Waste to Tank Farms, Pipeline"	TBD	Safety Environmental	Not modeled.	
13-5	(Paraphrased) Temperature of solution to be transferred (from 219-S Tank 102 to Tank Farms) must be < 90 °F.	ATS-LO-100-177, "222-S Laboratory Transfer 219-S Tank 102 Liquid Waste to Tank Farms, Pipeline"	ATS-LO-100-177, "222-S Laboratory Transfer 219-S Tank 102 Liquid Waste to Tank Farms, Pipeline"	TBD	Safety	Not modeled.	
13-6	(Paraphrased) Prior to transfer of liquid waste from 219-S to Tank Farms, the waste analysis results must be within the waste stream characteristics for the pipe line, and waste transfer has been approved.	ATS-LO-100-177, "222-S Laboratory Transfer 219-S Tank 102 Liquid Waste to Tank Farms, Pipeline"	TFC-ENG-CHEM-D-23, "Preparation of Tank Sampling and Analysis Plans" TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments" ATS-310, "222-S Laboratory Complex Waste Management Program," Section 6.4 ATS-MP-1011, "222-S Laboratory 219-S Tank 102 Sampling and Analysis Plan" ATS-LO-100-162, "222-S Laboratory Sample and Treat Liquid Wastes in 219-S Tank 102" TO-430-080, "Transfer from 219-S Tank 102 to SY-101"	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	Safety Environmental	Not modeled.	Need to identify "waste characteristics of the pipe line" (not defined in ATS-LO-100-177).

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
13-7	(Paraphrased) (222-S) Acceptance criteria established in RPP-29498 are designed to allow transfer of mixed waste (from 222-S) to the DST System.	RPP-29498, *Waste Analysis Plan for the 222-S Dangerous and Mixed Waste Treatment, Storage, and Disposal Unit*	ATS-MP-1011, "222-S Laboratory 219-S Tank 102 Sampling and Analysis Plan" ATS-310, Section 6.3 "222-S Laboratory Complex PCB Waste Management" ATS-310, Section 6.4, "222-S Laboratory Complex Waste Management Program"	DOE/RL-90-39, *Hanford Facility Dangerous Waste Permit Application, Double-Shell Tank System*, Chapter 1, Part A Form RPP-29002, *Double-Shell Tank Waste Analysis Plan* TFC-ESHQ-ENV-STD-02, "Regulated Substance Management" DOE/RL-2001-50, *Toxic Substances Control Act Polychlorinated Biphenyls Hanford Site Users Guide* 40 CFR 761, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions" ATS-310, " "222-S Laboratory Complex Waste Management Program," Section 6.4 WAC 173-303, "Dangerous Waste Regulations" RPP-10726, *Requirements for Discharge from Non-Tank Farm Waste Generators into the Double-Shell Tank System*	Environmental	Not modeled.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
13-8	The following waste is prohibited from management in the 222-S Laboratory TSD container storage units: a. Dangerous and/or mixed waste not identified on the Part A Form b. Reactive waste defined in WAC 173-303-090(7)(a)(vi), and (viii)	RPP-29498, *Waste Analysis Plan for the 222-S Dangerous and Mixed Waste Treatment, Storage, and Disposal Unit*	ATS-310, Section 6.4, "222-S Laboratory Complex Waste Management Program"	TFC-ESHQ-ENV-STD-02, "Regulated Substance Management" DOE/RL-2001-50, *Toxic Substances Control Act Polychlorinated Biphenyls Hanford Site Users Guide* 40 CFR 268, "Land Disposal Restrictions" 40 CFR 761, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions" WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion* WAC 173-303, "Dangerous Waste Regulations" DOE/RL-91-27, *Hanford Facility Permit Application, 222-S Dangerous and Mixed Waste Treatment, Storage, and Disposal Unit* RPP-16922, *Environmental Specification Requirements* RPP-29498, *Waste Analysis Plan for the 222-S Dangerous and Mixed Waste Treatment, Storage, and Disposal Unit* TFC-PLN-33, "Waste Management Basis"	Environmental	Not modeled.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
13-9	The following waste is prohibited from management in the 219-S Tank System: a. Dangerous and/or mixed waste not identified on the Part A Form. b. Reactive waste defined in WAC 173-303-090(7)(a)(vi), (vii), and (viii) c. Organic compounds not miscible with water forming a separable layer. d. Waste likely to precipitate to the extent drain lines will clog.	RPP-29498, *Waste Analysis Plan for the 222-S Dangerous and Mixed Waste Treatment, Storage, and Disposal Unit* HNF-12125, *222-S Laboratory Documented Safety Analysis*, Section 2.5.2.2	ATS-310, "222-S Laboratory Complex PCB Waste Management," Section 6.3 ATS-310, "222-S Laboratory Complex Waste Management Program," Section 6.4 ATS-MP-1011, "222-S Laboratory 219-S Tank 102 Sampling and Analysis Plan"	TFC-ESHQ-ENV-STD-02, "Regulated Substance Management" DOE/RL-2001-50, *Toxic Substances Control Act Polychlorinated Biphenyls Hanford Site Users Guide* 40 CFR 761, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions" ATS-310, *222-S Laboratory Administration*, Section 6.4, "222-S Laboratory Complex Waste Management Program" WAC 173-303, "Dangerous Waste Regulations"	Environmental Safety	Not modeled.	
	Interface 14 – Wastewater from 222-S Laboratory to TEDF						
14-1	pH between 6.5 and 9.0	HNF-SD-W049H-ICD-001, *200 Area Treated Effluent Disposal Facility Interface Control Document*	ATS-LO-100-167, "222-S Laboratory Sample and Transfer 207-SL Retention Basin Liquid Waste"	S2 of ST 4502, *State Waste Discharge Permit Number ST0004502* RPP-16922, *Environmental Specification Requirements*, Chapter 9 (222-S Laboratory)	Operation	Not modeled.	
14-2	Total alpha < 15 pCi/L	HNF-SD-W049H-ICD-001, *200 Area Treated Effluent Disposal Facility Interface Control Document*	ATS-LO-100-167, "222-S Laboratory Sample and Transfer 207-SL Retention Basin Liquid Waste"	S2 of ST 4502, *State Waste Discharge Permit Number ST0004502* RPP-16922, *Environmental Specification Requirements*, Chapter 9 (222-S Laboratory)	Environmental	Not modeled.	Target limit was taken from WAC 173-200, "Water Quality Standards for Groundwater of the State of Washington," since no limit was included in ST 4502.
14-3	Total beta < 50 pCi/L	HNF-SD-W049H-ICD-001, *200 Area Treated Effluent Disposal Facility Interface Control Document*	ATS-LO-100-167, "222-S Laboratory Sample and Transfer 207-SL Retention Basin Liquid Waste"	S2 of ST 4502, *State Waste Discharge Permit Number ST0004502* RPP-16922, *Environmental Specification Requirements*, Chapter 9 (222-S Laboratory)	Environmental	Not modeled.	Target limit was taken from WAC 173-200, "Water Quality Standards for Groundwater of the State of Washington," since no limit was included in ST 4502.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
14-4	On-line flow monitoring requirement (Maximum flow rate = 75 gpm based on 4-hour average)	HNF-SD-W049H-ICD-001, *200 Area Treated Effluent Disposal Facility Interface Control Document*	ATS-LO-100-167, "222-S Laboratory Sample and Transfer 207-SL Retention Basin Liquid Waste"	S2 of ST 4502, *State Waste Discharge Permit Number ST 4502* RPP-16922, *Environmental Specification Requirements*, Chapter 9 (222-S Laboratory)	Operation	Not modeled.	Maximum flow rate is a combined flow rate from all 222-S wastewater sources that could be generated. Flow rate based on total annual flow divided by 525,600 min (1 year).
	Interface 15 – Waste from West Area DSTs to East Area DSTs						
15-1 through 15-26	IFPs 9a-1 through 9a-26 are applicable to interface 15.	N/A	N/A	N/A	N/A	N/A	
15-27 through 15-31	IFPs 9a-28 through 9a-32 are applicable to interface 15.	N/A	N/A	N/A	N/A	N/A	
15-32	IFP 9b-6 is applicable to interface 15.	N/A	N/A	N/A	N/A	N/A	
15-33	During normal operations, mixer-pumps will not be operated with less than 36 inches of waste in the tank for DST to DST transfers to prevent damage to the pumps.	HNF-SD-WM-TRD-007, *Double-Shell Tank System Specification*	TFC-ENG-CHEM-C-11, "Process Control Plans"	ORP-11242, *River Protection Project System Plan*	Technical	Slurries can be removed to within 36 in. above the bottom of the tank for DST-to-DST transfers.	
15-34	The valve meets requirements of ASME B31.3 and ASME B16.34 Special class 900 rating for a minimum working pressure of 1490 psig at 200 °F.	RPP-RPT-47572, *Cross-Site Slurry Line Evaluation Report*	TFC-ENG-CHEM-C-11, "Process Control Plans"	W-058-P9, *Air Operated Ball Valves*, Section 3.3.3.1	Technical	Not modeled.	NOTE: The operating pressure through the DST Transfer Piping is controlled by rupture disks, which burst at 400 lbf/in^2. Per HNF-4160, *Double Shell Tank Transfer Valving Subsystem Specification*, Section 3.2.1(c), valves that will normally transport waste shall have a design pressure of > 400-psig and a design temperature of > 200 °F for DST farms and a design pressure of > 400-psig and design temperature of > 180 °F for SST waste retrieval systems. Valves installed at DSTs in support of SST retrieval activities shall be

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
							designed for a design pressure of > 400-psig and a design temperature of > 180 °F.
15-35	The Cross-site Transfer System shall be capable of withstanding slurry wastes and liquids with the following physical characteristics. Temperatures: Waste 80 °F to 200 °F Flush Water 35 °F to 200 °F	RPP-RPT-47572, *Cross-Site Slurry Line Evaluation Report*	TFC-ENG-CHEM-C-11, “Process Control Plans”	WHC-SD-W058-FDC-001, *Functional Design Criteria for Project W-058, Replacement of Cross-Site Transfer System*, Section 3.2.1 WHC-SD-W058-DRD-001, *Preliminary Design Requirements Document for Project W-058, Replacement of the Cross-Site Transfer System*, Section 3.2.6.5	Technical	Not modeled.	
15-36	The cross-site booster pumps discharge ranges from 802 psig at a flow rate of 215.3 gpm to 1266 psig with no flow.	RPP-RPT-47572, *Cross-Site Slurry Line Evaluation Report*	TFC-ENG-CHEM-C-11, “Process Control Plans”	Sulzer Bingham®5 Booster Pump Curve Data	Technical	Modeled at 140 gpm, however the actual waste transfer rates through the cross-site supernatant line can be between 50 to 60 gpm and transfers through the cross-site slurry line can be between 100 to 120 gpm.	
15-37	The cross-site transfer backup flushing system shall be capable of delivering flush water to the cross-site transfer system piping at a volumetric flow rate of 140 gpm.	RPP-RPT-47572, *Cross-Site Slurry Line Evaluation Report*	TFC-ENG-STD-26, “Waste Transfer, Dilution, and Flushing Requirements”	WHC-SD-W058-DRD-001, *Preliminary Design Requirements Document for Project W-058, Replacement of the Cross-Site Transfer System*, Table A-2	Technical	Cross site flush volume per transfer: 24,000 gal	
	Interface 16 – Waste from MUST/IMUST to DSTs						
16-1 through 16-26	IFPs 9a-1 through 9a-26 are applicable to interface 16.	N/A	N/A	N/A	N/A	N/A	In HTWOS 550 kgal of IMUST waste will be received between 2020 and 2039. No additional water flush is assumed. (RPP-17152, *Hanford Tank Waste Operations Simulator (HTWOS) Version 7.7 Model Design Document*, Section 4.3.114.3.12). Inventory estimates for this stream are provided in

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
							RPP-33715, *Double-Shell and Single-Shell Tank Inventory Input to the Hanford Tank Waste Operations Simulator Model – 2012 Update*.
16-27 through 16-28	IFPs 9a-28 through 9a-29 are applicable to interface 16.	N/A	N/A	N/A	N/A	N/A	
16-29	Criticality Safety Representative (CSR)/Alternate approval is required on waste compatibility assessments of waste transfers from non-tank farm facilities. Waste transfers into the DST system from non-Tank Farm facilities or interfacing facilities must comply with the limits provided in Table 3-3 and Table 3-4 (both reproduced below) or a criticality safety evaluation must be completed documenting that the waste may be received and stored safely in the DST system. The sum of sub-critical mass fractions is calculated by summing the division of the actual mass of absorber to fissile material to the sub-critical mass ratio of absorber from Table 3-4. Table 3-3. Criticality Limits for Transfers from Non-Tank Farms Facilities CRITERIA: LIMIT Alkalinity of incoming waste from non-Tank Farms facilities other than the 242-A Evaporator: pH ≥ 8.0 Alkalinity of non-radioactive chemicals added to the tank waste system (excluding water from any source): pH ≥ 7.0 X/Pu of incoming waste containing more than 0.001 g/L Pu-equivalent, where the total g Pu-eq in the transfer is 50 g or less: Σ sub-critical mass fractions > 1 X/Pu of incoming waste containing more than 0.001 g/L Pu-equivalent, where the total g Pu-eq in the transfer is more than 50 g: Σ sub-critical mass fractions > 2 Maximum bulk fissile material concentration in incoming waste transfers from non-Tank Farm facilities other than 242-A Evaporator: [Pu-eq] < 0.04 g/L Maximum Pu-equivalent concentration in source waste without considering absorber/Pu-equivalent ratio: ≤0.001 g/L Table 3-4. Minimum Absorber/Pu Mass Ratios NEUTRON ABSORBER (X) : MINIMUM NEUTRON ABSORBER/Pu SUB-CRITICAL MASS RATIO (X/Pu) Chromium (Cr) : 135 Iron (Fe) : 160 Manganese (Mn) : 32 Nickel (Ni) : 105 Uranium (U)* : 770 * Note: Only ^{238}U may be credited as a neutron absorber in incoming waste transfers.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	RPP-7475, *Criticality Safety Evaluation of Hanford Tank Farms Facility (CSER)* CPS-T-149-00012, "Criticality Prevention Specifications"	Safety	Not modeled.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
16-30	Transfers involving the addition of solids to tanks 241-AN-102, 241-AN-106, 241-AN-107, 241-A Y-101, and 241-AY-102 require additional evaluation of interstitial liquids for compliance with waste chemistry limits specified in HNF-SD-WM-OCD-015, Table 3-10 (reproduced below). Table 3-10 Waste Chemistry Limits for the Interstitial Liquid of tanks 241-AN-102, AN-106, AN-107, AY-101, and AY-102 TEMPERATURE : LIMIT ≤ 122 °F : $[NO_2^-]/[NO_3^-] \geq 0.32$ ≤ 122 °F : pH ≥ 10	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* (Rev. 31) OSD-T-151-00007, *Operating Specifications for the Double-Shell Storage Tanks*	TFC-ENG-CHEM-P-13, *Tank Waste Compatibility Assessments*	Letter CH2M-0602740, *Expert Panel Oversight Committee Assessment of the 241-AN-107 and 241-AN-102 Waste Chemistry Corrosion Testing for Double-Shell Tank Waste Chemistry Optimization* RPP-RPT-31680, *Hanford Tanks 241-AN-107 and 241-AN-102: Effect of Chemistry and Other Variables on Corrosion and Stress Corrosion Cracking* RPP-ASMT-37653, *Expert Panel Oversight Committee Assessment of RPP-RPT-35923, Hanford Tank AY101: Effect of Chemistry and Other Variables on Corrosion and Stress Corrosion Cracking*. RPP-RPT-35923, *Hanford Tank AY101: Effect of Chemistry and Other Variables on Corrosion and Stress Corrosion Cracking.* RPP-ASMT-35619, *Expert Panel Oversight Committee Assessment of Fiscal Year 2007 Corrosion and Stress Corrosion Cracking Simulant Testing Program and the Impact on Double-Shell Tank 241-AY102* RPP-RPT-33284, *Hanford Tanks AY102 and AP101: Effect of Chemistry and Other Variables on Corrosion and Stress Corrosion Cracking.* RPP-ASMT-46121, *Corrosion Propensity Assessment for 241-AN-106 Waste.*	Technical	During retrieval of waste from the SSTs to the DST system, sodium hydroxide and sodium nitrite will be added as needed so that the as-retrieved liquid phase composition satisfies the DST waste chemistry limits given in Table 3-2 of HNF-SD-WM-OCD-015 (Rev. 24), *Tank Waste Transfer Compatibility Program.* Issue: The model does not currently check nor correct for $[OH^-]$ or $[NO_2^-]$ concentrations that are greater than their upper limits, nor for $[NO_3^-]$ concentrations greater than 5.5 M.	The concentration limits for 241-AN-102, 241-AN-106, 241-AN-107, 241-AY-101, and 241-AY-102 interstitial liquid are based on Expert Panel Oversight Committee for Chemistry Optimization recommendations which are supported by test data. The $[NO_2^-]/[NO_3^-]$ limit of ≥ 0.32 does not apply to 241-AY-102, because the interstitial liquid has low concentrations of nitrite and nitrate and the ratio does not satisfy the limit. These tests were also conducted at 77 °C (170 °F) and showed a low propensity for Stress Corrosion Cracking. There is an offsetting factor in that this interstitial liquid has a high carbonate concentration. In RPP-ASMT-35619, the Expert Panel states that this carbonate based waste does not promote pitting corrosion and the potential range for stress corrosion cracking is so negative that it is not a credible threat in the interstitial liquid of 241-AY-102.
	Interface 17a – Waste from B Complex SSTs to B Complex WRF						
17a-1	IFP 9a-11 is applicable to interface 17a.	N/A	N/A	N/A	N/A	N/A	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
17a-2 through 17a-8	IFPs 9a-13 through 9a-19 are applicable to interface 17a.	N/A	N/A	N/A	N/A	N/A	
17a-9	IFPs 9a-24 is applicable to interface 17a.	N/A	N/A	N/A	N/A	N/A	
17a-10 through 17a-11	IFPs 9a-27 and 9a-28 are applicable to interface 17a.	N/A	N/A	N/A	N/A	N/A	
17a-12 through 17a-14	IFPs 9a-30 and 9a-31 are applicable to interface 17a.	N/A	N/A	N/A	N/A	N/A	
17a-15	B Complex retrieval rates will vary by technology. The currently assumed retrieval technologies and associated rates are: Modified sluicing – in-tank vehicle – 95 gpm Modified sluicing – high PO_4 Eqpt + In-tank vehicle – 95 gpm Mobile arm retrieval system – sluicing (High PO_4 Salt) – 95 gpm Mobile arm retrieval system – vacuum – 95 gpm Mobile arm retrieval system – vacuum (High PO_4 Salt) – 95 gpm	RPP-40545, *Quantitative Assumptions for Single-Shell Tank Waste Retrieval Planning*, Table A.4.3-1	TFC-ENG-CHEM-C-11, "Process Control Plans"	RPP-40545, *Quantitative Assumptions for Single-Shell Tank Waste Retrieval Planning*, Section A.3 RPP-RPT-50506, *MARS-V Technology Phase II Qualification Test Report*	Technical	The retrieval minimum volumes and durations calculated in SVF-1647, *SVF-1647_Rev_5_Calculation_of_SST_Retrieval_Volumes_and_Durations.xlsx*, form the input into the model for the SST retrieval durations and volumes. The SST waste retrieval rates are based on the retrieval technology that is planned for each tank. HTWOS uses an average retrieval rate based on the initial inventory and the minimum retrieval duration. Waste transfer durations are calculated by dividing the total volume being transferred by the transfer rate. There is a 5-day delay between subsequent uses of transfer routes having common components starting after the C Farm retrievals are completed. This accounts for the closeout of one transfer route and the establishment of another route. There is a 2-week wait period between	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
						selecting an SST for retrieval and the beginning of retrieval operations to allow sufficient time for retrieval and route setup.	
17a-16	Transfers involving the addition of solids to tanks 241-AN-102, 241-AN-106, 241-AN-107, 241-A Y-101, and 241-AY-102 require additional evaluation of interstitial liquids for compliance with waste chemistry limits specified in HNF-SD-WM-OCD-015, Table 3-10 (reproduced below) Table 3-10 Waste Chemistry Limits for the Interstitial Liquid of tanks 241-AN-102, AN-106, AN-107, AY-101, and AY-102 TEMPERATURE : LIMIT ≤ 122 °F : $[NO_2^-]/[NO_3^-] \geq 0.32$ ≤ 122 °F : pH ≥ 10 > 122 °F : Limits in IFP 9a-22 apply	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* (Rev. 31) OSD-T-151-00007, *Operating Specifications for the Double-Shell Storage Tanks*	TFC-ENG-CHEM-P-13, *Tank Waste Compatibility Assessments*	Letter CH2M-0602740, *Expert Panel Oversight Committee Assessment of the 241-AN-107 and 241-AN-102 Waste Chemistry Corrosion Testing for Double-Shell Tank Waste Chemistry Optimization* RPP-RPT-31680, *Hanford Tanks 241-AN-107 and 241-AN-102: Effect of Chemistry and Other Variables on Corrosion and Stress Corrosion Cracking* RPP-ASMT-37653, *Expert Panel Oversight Committee Assessment of RPP-RPT-35923, Hanford Tank AY101: Effect of Chemistry and Other Variables on Corrosion and Stress Corrosion Cracking*. RPP-RPT-35923, *Hanford Tank AY101: Effect of Chemistry and Other Variables on Corrosion and Stress Corrosion Cracking.* RPP-ASMT-35619, *Expert Panel Oversight Committee Assessment of Fiscal Year 2007 Corrosion and Stress Corrosion Cracking Simulant Testing Program and the Impact on Double-Shell Tank 241-AY102* RPP-RPT-33284, *Hanford Tanks AY102 and AP101: Effect of Chemistry and Other Variables on Corrosion and Stress Corrosion Cracking.* RPP-ASMT-46121, *Corrosion Propensity Assessment for 241-*	Technical	During retrieval of waste from the SSTs to the DST system, sodium hydroxide and sodium nitrite will be added as needed so that the as-retrieved liquid phase composition satisfies the DST waste chemistry limits given in Table 3-2 of HNF-SD-WM-OCD-015 (Rev. 24), *Tank Waste Transfer Compatibility Program.* Issue: The model does not currently check nor correct for [OH-] or $[NO_2^-]$ concentrations that are greater than their upper limits, nor for $[NO_3^-]$ concentrations greater than 5.5 M.	The concentration limits for 241-AN-102, 241-AN-106, 241-AN-107, 241-AY-101, and 241-AY-102 interstitial liquid are based on Expert Panel Oversight Committee for Chemistry Optimization recommendations which are supported by test data. The $[NO_2^-]/[NO_3^-]$ limit of ≥ 0.32 does not apply to 241-AY-102, because the interstitial liquid has low concentrations of nitrite and nitrate and the ratio does not satisfy the limit. These tests were also conducted at 77 °C (170 °F) and showed a low propensity for Stress Corrosion Cracking. There is an offsetting factor in that this interstitial liquid has a high carbonate concentration. In RPP-ASMT-35619, the Expert Panel states that this carbonate based waste does not promote pitting corrosion and the potential range for stress corrosion cracking is so negative that it is not a credible threat in the interstitial liquid of 241-AY-102.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
				AN-106 Waste.			
	Interface 17b – Supernate Recycle from B Complex WRF to B Complex SSTs						
17b-1 through 17b-5	IFPs 9b-1 through 9b-5 are applicable to interface 17b.	N/A	N/A	N/A	N/A	N/A	
17b-6 through 17b-26	IFPs 9b-7 through 9b-27 are applicable to interface 17b.	N/A	N/A	N/A	N/A	N/A	
17b-27	B Complex WRF to SST transfers are currently restricted to supernate. Retrieval liquids that may be added to the SSTs only following appropriate Ecology approvals pursuant to applicable Hanford Federal Facility Agreement and Consent Order or other enforceable milestones. Retrieval liquids may include the Double-Shell Tank waste for the purpose of dissolution and to facilitate SST retrieval operations.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*, Section 3.3.3.1	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	WA7 89000 8967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*,, Part V, Closure Unit 4, "SST Part A"	Environmental	Not modeled.	
17b-28	Liquid waste levels shall be at least 64 inches in all 241-AY, AZ Farm Tanks when annulus ventilation is in operation. Liquid waste levels shall be at least 6 inches in 241-AN, AW, AY, and AZ Farm Tanks, and at least 12 inches in 241-AP Farm Tanks when primary ventilation is in operation. Note that liquid levels are subject to change based upon mission needs in accordance with ORP-11242. Changes to liquid levels will be addressed in the latest version of DST operating specification.	HNF-SD-WM-TRD-007, *Double-Shell Tank System Specification*	*Critical Flow Velocity Calculations for Waste Transfer Piping*	*Critical Flow Velocity Calculations for Waste Transfer Piping*	Technical	Not modeled.	
	Interface 18a – Waste from B Complex WRF to East Area DSTs						
18a-1 through 18a-32	IFPs 9a-1 through 9a-32 are applicable to interface 18a.	N/A	N/A	N/A	N/A	N/A	
18a-33	B Complex waste stream (dangerous waste) codes must be included within the DST Part A permit.	WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 12, "Double-Shell Tank System & 204-AR Waste Unloading Station"	N/A	N/A	Environmental	Not modeled	LIB
18a-34	IFP 17a-16 is applicable to interface 18a.	N/A	N/A	N/A	N/A	N/A	
	Interface 18b – Supernate from East Area DSTs to B Complex WRF						
18b-1	IFP 9b-6 is applicable to interface 18b.	N/A	N/A	N/A	N/A	N/A	
18b-2	IFP 9b-11 is applicable to interface 18b.	N/A	N/A	N/A	N/A	N/A	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
18b-3 through 18b-6	IFPs 9b-14 through 9b-17 are applicable to interface 18b.	N/A	N/A	N/A	N/A	N/A	
18b-7 through 18b-9	IFPs 9b-19 through 9b-21 are applicable to interface 18b.	N/A	N/A	N/A	N/A	N/A	
18b-10	IFP 17b-28 is applicable to interface 18b.	N/A	N/A	N/A	N/A	N/A	
18b-11	DST waste stream (dangerous waste) codes must be included within the WRF Part A permit.	WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 12, “Double-Shell Tank System & 204-AR Waste Unloading Station”	N/A	N/A	Environmental	Not modeled.	
	Interface 19a – Waste from C Farm SSTs to East Area DSTs						
19a-1 through 19a-32	IFPs 9a-1 through 9a-32 are applicable to interface 19a.	N/A	N/A	N/A	N/A	N/A	
19a-33	C Farm retrieval rates will vary by technology. The currently assumed retrieval technologies and associated rates are: Modified sluicing – in-tank vehicle – 95 gpm Mobile arm retrieval system – vacuum – 95 gpm Mobile arm retrieval system – sluicing – 95 gpm Modified sluicing + chemical dissolution – 95 gpm	RPP-40545, *Quantitative Assumptions for Single-Shell Tank Waste Retrieval Planning*, Table A.4.3-1	TFC-ENG-CHEM-C-11, “Process Control Plans”	RPP-40545, *Quantitative Assumptions for Single-Shell Tank Waste Retrieval Planning*, Section A.3 RPP-RPT-50506, *MARS-V Technology Phase II Qualification Test Report*	Technical	The retrieval minimum volumes and durations calculated in SVF-1647, *SVF-1647_Rev_5_Calculation_of_SST_Retrieval_Volumes_and_Durations.xlsx*, form the input into the model for the SST retrieval durations and volumes. The SST waste retrieval rates are based on the retrieval technology that is planned for each tank. HTWOS uses an average retrieval rate based on the initial inventory and the minimum retrieval duration. Waste transfer durations are calculated by dividing the total volume being transferred by the transfer rate. There is a 5-day delay between subsequent uses	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
						of transfer routes having common components starting after the C Farm retrievals are completed. This accounts for the closeout of one transfer route and the establishment of another route. There is a 2-week wait period between selecting an SST for retrieval and the beginning of retrieval operations to allow sufficient time for retrieval and route setup.	
19a-34	IFP 17a-16 is applicable to interface 19a.	N/A	N/A	N/A	N/A	N/A	
	Interface 19b – Supernate Recycle from East Area DSTs to C Farm						
19b-1 through 19b-27	IFPs 9b-1 through 9b-27 are applicable to interface 19b.	N/A	N/A	N/A	N/A	N/A	
19b-28	IFP 17b-28 is applicable to interface 19b.						
	Interface 20a – Waste from A Complex SSTs to East Area DSTs						
20a-1 through 20a-32	IFPs 9a-1 through 9a-32 are applicable to interface 20a.	N/A	N/A	N/A	N/A	N/A	
20a-33	A & AX Farm retrieval rates will vary by technology. The currently assumed retrieval technologies and associated rates are: Mobile arm retrieval system – vacuum – 95 gpm Modified sluicing + chemical dissolution – 95 gpm Extended reach sluicing system – high pressure water – 95 gpm Modified mobile arm retrieval system – vacuum + chemical dissolution – 95 gpm	RPP-40545, *Quantitative Assumptions for Single-Shell Tank Waste Retrieval Planning*, Table A.4.3-1	TFC-ENG-CHEM-C-11, “Process Control Plans”	RPP-40545, *Quantitative Assumptions for Single-Shell Tank Waste Retrieval Planning*, Section A.3 RPP-RPT-50506, *MARS-V Technology Phase II Qualification Test Report*	Technical	The retrieval minimum volumes and durations calculated in SVF-1647, *SVF-1647_Rev_5_Calculation_of_SST_Retrieval_Volumes_and_Durations.xlsx*, form the input into the model for the SST retrieval durations and volumes. The SST waste retrieval rates are based on the retrieval technology that is planned for each tank. HTWOS uses an average retrieval rate based on the initial	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
						inventory and the minimum retrieval duration. Waste transfer durations are calculated by dividing the total volume being transferred by the transfer rate. There is a 5-day delay between subsequent uses of transfer routes having common components starting after the C Farm retrievals are completed. This accounts for the closeout of one transfer route and the establishment of another route. There is a 2-week wait period between selecting an SST for retrieval and the beginning of retrieval operations to allow sufficient time for retrieval and route setup.	
20a-34	IFP 17a-16 is applicable to interface 20a.	N/A	N/A	N/A	N/A	N/A	
	Interface 20b – Supernate Recycle from East Area DSTs to A Complex SSTs						
20b-1 through 20b-27	IFPs 9b-1 through 9b-27 are applicable to interface 20b.	N/A	N/A	N/A	N/A	N/A	
20b-28	IFP 17b-28 is applicable to interface 20b.	N/A	N/A	N/A	N/A	N/A	
	Interface 21 – Waste from PUREX and T-Plant Deactivation to East Area DSTs						
21-1	Refer to pertinent interface 9a IFPs (for transfers to DSTs)	N/A	N/A	N/A	N/A	N/A	
	Interface 22a – Waste from AW Farm to 242-A Evaporator (Feed)						

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
22a-1	(Paraphrased) The properties of the 242-A Evaporator feed stream are: Temperature: 65-120 °F Flow rate: 90 gpm (average) with a range of 70-130 gpm Specific Gravity: ~1.0 – 1.4 Maximum pressure 275 lb/in^2 gauge Note: Specific process parameter values are selected for each campaign and defined in a Process Control Plan.	HNF-14755, *242-A Evaporator Documented Safety Analysis*	TFC-ENG-CHEM-C-11, "Process Control Plans"	RPP-18465, *Technical Basis for the 242-A Evaporator Operating Specifications* ARH-2929-1, *Functional Design Criteria 242-A Evaporator Crystallizer Facilities*	Process	The flow rate from 241-AW-102 to 242-A is variable and dependent on waste properties (see RPP-17152, *Hanford Tank Waste Operations Simulator (HTWOS) Version 7.7 Model Design Document*, Figure 5-1). The minimum volume of an evaporator campaign will be 500 kgal (RPP-17152, Section 5.3.10). The minimum volume for a transfer of waste into Tank AW-102 is 50 kgal (RPP-17152, Section 5.3.11).	The C-A-1 feed vessel can operate up to 200F. There is a flam gas trip on the vessel at 160 and per HNF-14755, Section 2.5.9.3.2.3, normal operations are between 120 and 130 °F. A limit of 120 would prevent flashing; however, a temperature limit was not evident in the documentation.
22a-2	Ammonia in the 242-A Evaporator feed is controlled to prevent release of ammonia gas from the vessel ventilation system in excess of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) limit of 100 lb per 24-hr period.	HNF-14755, *242-A Evaporator Documented Safety Analysis*, Page 2-28	TFC-ENG-CHEM-C-11, "Process Control Plans"	40 CFR 302, "Designation, Reportable Quantities, and Notification"	Environmental	Emissions are based on split factors. Ammonia is tracked, but there is no control on the ammonia content of the evaporator feed.	
22a-3	Samples of underground storage tank contents scheduled for use in a 242-A Evaporator campaign are required to verify that the waste is acceptable feed for the 242-A Evaporator. Samples are taken and analyzed before the tank contents are transferred to the feed tank and before they are pumped from the feed tank to the 242-A Evaporator. The sampling and analysis requirements for the 242-A Evaporator are established in HNF-SD-WM-DQO-014, *242-A Evaporator Data Quality Objectives*. DST wastes are not accepted for treatment in the 242-A Evaporator unless the 242-A Evaporator waste acceptance criteria are satisfied, and the process condensate projected to be generated via treatment in the 242-A Evaporator satisfies LERF waste acceptance criteria.	HNF-14755, *242-A Evaporator Documented Safety Analysis* WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 4, "242-A Evaporator," Chapter 3, Waste Analysis Plan	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments" TFC-ENG-CHEM-D-23, "Preparation of Tank Sampling and Analysis Plans"	WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 4, "242-A Evaporator," Chapter 3, Waste Analysis Plan	Safety Environmental	A minimum dwell time in the DST is allocated for the sampling and analysis of dilute feed staged in one or more DSTs and for preparation of a process control plan before the feed can be fed through the evaporator. The dwell time used in a given scenario is selected by the modeler.	Data quality objectives identify the rational and analyses required on the samples taken from the underground storage tanks scheduled for processing or candidate feed tanks. The analyses performed include the following: exothermic reaction analysis, inorganic analyses, organic analyses, boildown, radionuclide analyses (HNF-14755, P. 2-74) Feed to the evaporator is staged in a DST for a minimum of four months before being evaporated. A four-month period is allocated for the sampling and analysis of dilute feed staged in one or more DSTS and for preparation

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
							of a process control plan before that feed can be run through the evaporator. The four months is based on 242-A Evaporator operating experience (RPP-17152, *Hanford Tank Waste Operations Simulator (HTWOS) Version 7.7 Model Design Document*, Section 5.3.3)
22a-4	A surface sample of each candidate feed tank is taken for visual inspection and analytical tests are performed to check for separable organics. These samples are taken when there is inadequate surface sample data prior to a campaign. If a separable organic layer is observed, an operating specification limits the lower liquid level in feed tank 241-AW-102. (HNF-14755) If there is a separate visible organic layer in the candidate feed tank samples or if the water content is <25%, then the waste cannot be processed by the evaporator and is rejected; otherwise, the waste can be transferred to the evaporator for processing. (HNF-SD-WM-DQO-014) This is listed in Table 3.4 of the *242-A Evaporator Dangerous Waste Permit*, Chapter 3, Waste Analysis Plan as testing that should be conducted to satisfy WAC 173-303-300 requirements. (WA7890008967) Prior to operation of the evaporator, the absence of separable organics must be verified or managed to preclude transfer to the 242-A Evaporator. (WA7890008967) Transfers involving waste staging for the 242-A Evaporator feed require verification on laboratory analysis that the feed contains no separable organics. (HNF-SD-WM-OCD-015)	HNF-14755, *242-A Evaporator Documented Safety Analysis*, Page 2-25 HNF-SD-WM-DQO-014, *242-A Waste Feed Data Quality Objectives (DQO)* WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit*, *Dangerous Waste Portion*, Part III, Operating Unit Group 4, “242-A Evaporator,” Chapter 3, Waste Analysis Plan HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* TFC-ENG-CHEM-P-13, “Tank Waste Compatibility Assessments” TFC-ENG-CHEM-C-11, “Process Control Plans” TFC-ENG-FACSUP-C-04, “Process Memos” TFC-ENG-CHEM-D-23, “Preparation of Tank Sampling and Analysis Plans”	HNF-3172, *Liquid Waste Processing Facilities Waste Acceptance Criteria* WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit*, *Dangerous Waste Portion*, Part III, Operating Unit Group 4, “242-A Evaporator,” Chapter 3, Waste Analysis Plan OSD-T-151-00012, *Operating Specifications for the 242-A Evaporator*	Safety Environmental	Not modeled.	This limit is a control designed to prevent pumping separable organics into the 242-A Evaporator. (HNF-14755) The transfer of separable organics from the 242-A Evaporator to the LERF is prohibited. (OSD-T-151-00012) <u>OSD-T-151-00012</u>: To ensure that separable organic material is not transferred to the LERF, the following operational practices are required. • Separable organic must be excluded from 242-A Evaporator feed. If separable organic is detected in candidate feed samples, the waste cannot be processed. • The fluid level in condensate tank C-100 shall be maintained at or above 50% during routine operations. This will ensure that any separable organic remains in C-100. • At the conclusion of a campaign, C-100 shall be overflowed to displace

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
							any floating organic back to the AW-102 feed tank.
22a-5	The levels of volatile organics in the candidate feed tanks must be limited to prevent organic vessel vent emissions on the Hanford Site from exceeding 3 lbs/hr and 3.1 tons/yr during processing (1.4 kilograms per hour and 2,800 kilograms per year). (HNF-SD-WM-DQO-014) To ensure this limit is not exceeded there are limits for individual organic constituents in the candidate feed tanks. The following are the organic constituent action limits from Table 4-2 in HNF-SD-WM-DQO-014 and are applicable for a flow ratio of 2 and a total operating time equivalent to six months per year: Acetone: 174.4 x (R-1)/R mg/L (when R = 2 Limit = 87.2 mg/L) 1-Butanol: 452 x (R-l)IR mg/L (when R = 2 Limit = 226 mg/L) 2-Butanone (MEK): 116 x (R-lI)IR mg/L (when R = 2 Limit = 58 mg/L) 2-Butoxyethanol: 190.4 x (R-1)/R mg/L (when R = 2 Limit =95.2) Tributyl phosphate 2.020E + 04 x (R-I)/R mg/L (when R =2 Limit = 10 150 mg/L) TC, TIC: (TC-TIC) < 174.4 x (R-l)/R mg/L (when R =2 Limit = 87 mg/L) (as acetone) Tentatively identified compounds from VOA and SVOA analyses: Required for the evaluation of any other organic constituents that may be of concern. These same limits are included in Table 3.2 of the *242-A Evaporator Dangerous Waste Permit*, Chapter 3, “Waste Analysis Plan.” (WA7890008967) This is listed in Table 3.4 of the *242-A Evaporator Dangerous Waste Permit*, Chapter 3, “Waste Analysis Plan,” as testing that should be conducted to satisfy WAC 173-303-300 requirements. (WA7890008967) NOTE: TC-TIC = TOC which is limited to a lower limit than the individual species.	HNF-SD-WM-DQO-014, *242-A Waste Feed Data Quality Objectives (DQO)* WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 4, “242-A Evaporator,” Chapter 3, Waste Analysis Plan	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* TFC-ENG-CHEM-P-13, “Tank Waste Compatibility Assessments” TFC-ENG-CHEM-C-11, “Process Control Plans” 242-65J-002, “Sampling Operations at 242-A Evaporator”	WHC-SD-WM-ES-380, *Organic Emission Calculations for 242-A Evaporator Vessel Vent System* <u>Regulatory Bases</u>: 40 CFR 264.1032, “Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities,” Standards: Process Vents WAC 173-303, “Dangerous Waste Regulations” WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 4, “242-A Evaporator,” Chapter 3, Waste Analysis Plan WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 4, “242-A Evaporator,” Chapter 6, Procedures to Prevent Hazards	Environmental	Not modeled	The action limits are shown in HNF-SD_WM-DQO-014, Table 4-2 for a specified flow rate ratio of 2. The limit could change with a different flow rate. The limits in Table 4-2 are based on a maximum continuous operating time equivalent to six months per year. Therefore, if the total operating time is expected to exceed six months per year, the limits must be reevaluated. As indicated in Table 4-2, tentatively identified compounds and TC-TIC are not included in the summation action limit. Also, tentatively identified compounds do not have an action limit. If tentatively identified compounds are found, they are evaluated subjectively. The Hanford Facility RCRA Permit, Operating Unit Group 4, Chapter 3, requires the analysis of candidate DST waste feed containing organic concentrations. The acceptance limit has been set at 10 parts per million by weight or less. Organic emissions from treatment storage and disposal (TSD) units on the Hanford Site subject to 40 CFR 264, Subpart AA, are controlled to ensure emissions to do not exceed 1.4 kilograms per hour and 2,800 kilograms per year. To

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
							determine if these criteria are met, a campaign-specific Process Control Plan is prepared to estimate the potential emissions.
22a-6	The candidate feed tank has two action limits. The action limits for the candidate feed tank are any exotherms below 335 °F and an exotherm/endotherm ratio greater than 1.0. This is listed in Table 3.4 of the *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Chapter 3, Waste Analysis Plan, as testing that should be conducted to satisfy WAC 173-303-300 requirements. Note: An endotherm/exothermic reaction <=1 means that when the mixture is heated (measured in lab work by differential scanning calorimetry and/or thermal gravimetric analysis), the waste does not emit any energy.	HNF-SD-WM-DQO-014, *242-A Waste Feed Data Quality Objectives (DQO)* WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 4, “242-A Evaporator,” Chapter 3, Waste Analysis Plan	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* TFC-ENG-CHEM-C-11, “Process Control Plans” TFC-ENG-CHEM-P-13, “Tank Waste Compatibility Assessments”	RPP-18465, *Technical Basis for the 242-A Evaporator Operating Specifications* Regulatory Basis: WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 4, “242-A Evaporator,” Chapter 3, Waste Analysis Plan	Safety Environmental	Not modeled.	See RPP-PLAN-55022, *Process Control Plan for 242-A Evaporator Campaigns 13-01 and 14-01*, Section 3.4.8 for an example of this analysis. RPP-18465 provides technical basis for 335F, but does not address the exotherm/endotherm ratio greater than 1. Ratios greater than 1 provide a net increase in heat. WAC 173-303-395(1), “Other general requirements,” requires waste handling be conducted to prevent an uncontrolled reaction that could damage the tank system structural integrity or threaten human health or environment.
22a-7	To avoid line plugging the action limit for the Reynolds number is 4000. Waste cannot be transferred if the calculated Reynolds number is below 4000. If the calculated Reynolds number is greater than 4,000 and the calculated critical velocity is adequate to transfer the slurry, then the waste can be processed; otherwise, the waste must be adjusted to meet the Reynolds number and critical velocity, managed according to TFC-ENG-STD-26, “Waste Transfer, Dilution, and Flushing Requirements” [short periods (<2 hours) of transfer below critical velocity], or the waste is rejected for processing. Note: Critical velocity of the slurry stream exiting the evaporator is determined using the Oroskar/Turian method as outlined in RPP-19221, *Critical Flow Velocity Calculations for Waste Transfer Piping*.	HNF-SD-WM-DQO-014, *242-A Waste Feed Data Quality Objectives (DQO)* TFC-ENG-STD-26, “Waste Transfer, Dilution, and Flushing Requirements”	TFC-ENG-CHEM-C-11, “Process Control Plans” TFC-ENG-FACSUP-C-04, “Process Memos” HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* TFC-ENG-CHEM-P-13, “Tank Waste Compatibility Assessments”	HNF-2728, *Flow Velocity Analysis for Avoidance of Solids Deposition during Transport of Hanford Tank Waste Slurries* RPP-17247, *Dilution and Flushing Requirements to Avoid Solids Participation and Deposition During Tank Waste Transfers* RPP-19912, *Evaluation of Selected Evaporator Slurry Waste Transfers* RPP-19221, *Critical Flow Velocity Calculations for Waste Transfer Piping*	Technical	Not modeled	A variety of information is required to determine the critical velocity and Reynolds number. These data are: percent solids, specific gravity, slurry temperature, sodium concentration, particle density, particle size, pipe diameter, and viscosity. Calculations are shown in RPP-19221. Samples used to evaluate the line plugging issue are obtained from the candidate feed tank. The sodium concentration is obtained from the analysis

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
				NOTE: The above documents support the 6 ft/s or critical velocity calculation but do not specifically address the Reynolds number requirement.			of the feed tank supernate. The other parameters required to determine the critical velocity and the Reynolds number come from the boildown study and process knowledge. The technical justification for the Reynolds number limit is not directly evident in the technical basis documents listed. The correlations used to calculate critical velocity may assume turbulent flow.
22a-8	If the solids formation, SpG, TIC, and OH^- evaluations from samples obtained during the boildown study indicate the solids formation in the receiver tank will change the receiver tank to a Group A tank, then the SpG must be changed or the waste rejected for processing.	HNF-SD-WM-DQO-014, *242-A Waste Feed Data Quality Objectives (DQO)*	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* TFC-ENG-CHEM-C-11, “Process Control Plans” TFC-ENG-CHEM-P-13, “Tank Waste Compatibility Assessments”	RPP-10006, *Methodology and Calculations for the Assignment of Waste Groups for the Large Underground Waste Storage Tanks at the Hanford Site*	Technical	Not modeled.	HNF-IP-1266 is no longer a basis for this requirement, per below. The HNF-SD-WM-DQO-014 requirement cited from HNF-IP-1266 (*Tank Farms Operations Administrative Controls*, Section 5.10, “Flammable Gas Controls” states ‘Operations that would result in the re-designation of a WASTE Group B or C DST as a WASTE Group A tank are prohibited without prior written approval from the ORP Manager’) does not appear in HNF-IP-1266.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
22a-9	The CSER establishes a limit on the maximum plutonium-equivalence concentration for 242-A Evaporator feed solution of 0.005 g Pu-eq/L. (HNF-15000) Compliance with this limit is verified prior to each 242-A Evaporator campaign. (HNF-14755) In order to comply with criticality safety candidate feed tank samples are tested to check the following: 1. If the average Pu-eq concentration in the candidate feed tank waste is <0.005 g/L and the pH is >8, then the waste can be processed at the Evaporator; otherwise, the waste feed is rejected. (HNF-SD-WM-DQO-014 and HNF-SD-WM -DQO-001) 2. If the predicted slurry stream Pu-eq is <0.04 g/L and the pH is >8, then the waste can be processed; otherwise, the waste volume reduction and/or pH must be adjusted prior to processing the waste. (HNF-SD-WM-DQO-014)	HNF-15000, *CSER-03-008 Criticality Safety Evaluation Report for the 242-A Evaporator* HNF-SD-WM-DQO-014, *242-A Waste Feed Data Quality Objectives (DQO)* HNF-SD-WM-DQO-001, *Data Quality Objectives for Tank Farms Waste Compatibility Program* *HNF-14755, 242-A Evaporator Documented Safety Analysis*, Section 5.5.3.5.2	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* TFC-ENG-CHEM-C-11, "Process Control Plans" TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	CPS-T-149-00012, "Criticality Prevention Specifications" HNF-15000, *CSER-03-008 Criticality Safety Evaluation Report for the 242-A Evaporator Facility*	Safety	Not modeled.	The criticality issue data inputs are the concentrations of $^{239/240}Pu$, ^{233}U, and ^{235}U. In addition, a measurement or calculation of pH is required. Other than pH, the actual concentrations of these analytes are not action limits. Action limits are determined by combining concentrations of the analytes.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
22a-10	The radionuclide feed concentrations are used to forecast the radionuclide concentrations in the slurry and process condensate streams for evaluation against source term and criticality safety requirements. (HNF-14755) Based on data from the candidate feed tank samples the Evaporator source term will be controlled as follows: (HNF-SD-WM-DQO-014 1. If the average concentration of each constituent (see Table 4-3 from HNF-SD-WM-DQO-014, which is listed below) in the candidate feed tank waste is less than the action limits (bounding source term and inventory limits) for that constituent, then the waste can be transferred and processed at the Evaporator. 2. If the predicted concentration of each constituent (see Table 4-3) in the slurry stream is less than the action limits (bounding source term and inventory limits) for that constituent, then the waste can be transferred and processed at the Evaporator. Table 4-3. 242-A Evaporator Source Term Limits Radionuclide : Bounding Source Term (Ci/L) : Inventory Limits (Ci) ^{90}Sr : 2.2E-01 : 2.18E+04 ^{90}Y$^{(a)}$: 2.2E-01 : 2.18E+04 ^{137}Cs :1.5E+00 : 1.49E+05 $^{239/240}$Pu : 1 .6E-04 : 1.58E+01 ^{241}Pu : 1 .5E-02 : 1 .49E+03 ^{241}Am : 1.0E-03 : 9.90E+01 Total Unit Liter Dose : 1 .96E+00 : 1 .94E+05 Notes: $^{(a)}$ ^{90}Y is calculated from ^{90}Sr analysis.	HNF-SD-WM-DQO-014, *242-A Waste Feed Data Quality Objectives (DQO)* HNF-14755, *242-A Evaporator Documented Safety Analysis*	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments" TFC-ENG-CHEM-D-23, "Preparation of Tank Sampling and Analysis Plans"	HNF-IP-1266, *Tank Farms Operations Administrative Controls*, Section 5.9.4A RPP-5924, *Radiological Source Terms for Tank Farms Safety Analysis* RPP-30604, as amended, *Tank Farms Safety Analyses Chemical Source Term Methodology* WHC-SD-SQA-ANAL-20001, *MCNPH Calculated Gamma Dose at the 242-A Evaporator Building* WHC-SD-SQA-ANAL-20002, *Calculated Gamma Radiation at 242-A Evaporator's Area Radiation Monitors and Gamma Contour Plots at Selected Elevations* NOTE: A calculation basis document to support Table 4-3 in HNF-SD-WM-DQO-014 could not be located.	Safety	Not modeled.	The only source term requirement for the Evaporator is radiological. Therefore, no toxicological source term criteria are required. Concentrated slurry could create radiation fields that exceed shielding design criteria, potentially exposing facility workers in occupied areas of the 242-A Building. The 242-A Evaporator shielding is designed to reduce radiation levels to < 1 mR/h in office rooms and minimize radiation levels in other areas (WHC-SD-SQA-ANAL-20001, MCNPH *Calculated Gamma Dose at the 242-A Evaporator Building*, and WHC-SD-SQA-ANAL-20002, *Calculated Gamma Radiation at 242-A Evaporator's Area Radiation Monitors and Gamma Contour Plots at Selected Elevations*) when the ^{137}Cs concentration in the process liquid is < 1.5 Ci/L. Analysis of candidate feed tank waste is used to forecast ^{137}Cs concentration in the slurry product to confirm that it will be below 1.5 Ci/L. A limit of 0.8 Ci/L ^{137}Cs in process liquids has been established for ALARA purposes.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
22a-11	Analysis of candidate feed tank waste is used to forecast ^{137}Cs concentration in the slurry product to confirm that it will be below 1.5 Ci/L. A limit of 0.8 Ci/L ^{137}Cs in process liquids has been established.	HNF-14755, *242-A Evaporator Documented Safety Analysis*, Page 2-75 OSD-T-151-00012, *Operating Specifications for the 242-A Evaporator*	HNF-SD-WM-OCD-015, *Tank Farms Waste transfer Compatibility Program* TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments" TFC-ENG-CHEM-D-23, "Preparation of Tank Sampling and Analysis Plans"	ARH-2929-1, *Functional Design Criteria 242-A Evaporator Crystallizer Facilities* WHC-SD-SQA-ANAL-20001, *MCNPH Calculated Gamma Dose at the 242-A Evaporator Building* WHC-SD-SQA-ANAL-20002, *Calculated Gamma Radiation at 242-A Evaporator's Area Radiation Monitors and Gamma Contour Plots at Selected Elevations*	Safety	Not modeled.	ARH-2929-1, *Functional Design Criteria 242-A Evaporator-Crystallizer Facilities*, states a design level of 3.0 Ci/gal (0.80 Ci/L) Concentrated slurry could create radiation fields that exceed shielding design criteria, potentially exposing facility workers in occupied areas of the 242-A Building. The 242-A Evaporator shielding is designed to reduce radiation levels to < 1 mR/h in office rooms and minimize radiation levels in other areas (WHC-SD-SQA-ANAL-20001, *MCNPH Calculated Gamma Dose at the 242-A Evaporator Building*, and WHC-SD-SQA-ANAL-20002, *Calculated Gamma Radiation at 242-A Evaporator's Area Radiation Monitors and Gamma Contour Plots at Selected Elevations*) when the ^{137}Cs concentration in the process liquid is < 1.5 Ci/L. Analysis of candidate feed tank waste is used to forecast ^{137}Cs concentration in the slurry product to confirm that it will be below 1.5 Ci/L. A limit of 0.8 Ci/L ^{137}Cs in process liquids has been established for ALARA purposes.
22a-12	(Paraphrased) To ensure the ammonia concentration in the Evaporator process condensate does not exceed the LERF requirements, the average concentration of the ammonia in the candidate feed tank waste needs to be less than 6,800 mg/L when the Evaporator is operated with a ratio of feed	HNF-SD-WM-DQO-014, *242-A Waste Feed Data Quality Objectives (DQO)*	HNF-SD-WM-OCD-015, *Tank Farms Waste transfer Compatibility Program*	WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*,	Technical	Not modeled.	The limitations on the amount of ammonia processed during an Evaporator campaign are

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
	flow rate divided by slurry flow rate (R) of 2. (HNF-SD-WM-DQO-014, HNF-SD-WM-OCD-015) This is listed in Table 3.4 of the 242-A Evaporator Dangerous Waste Permit, Chapter 3, Waste Analysis Plan as testing that should be conducted to satisfy WAC 173-303-300 requirements. (WA7890008967)	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 4, “242-A Evaporator,” Chapter 3, Waste Analysis Plan	TFC-ENG-CHEM-P-13, “Tank Waste Compatibility Assessments” TFC-ENG-CHEM-D-23, “Preparation of Tank Sampling and Analysis Plans”	Part III, Operating Unit Group 4, “242-A Evaporator,” Chapter 3, Waste Analysis Plan HNF-3172, *Liquid Waste Processing Facilities Waste Acceptance Criteria*			determined by LERF requirements established in prior safety analyses and vessel vent discharge limits governed by 40 CFR 302, “Designation, Reportable Quantities, and Notification.” Ammonia concentrations in the process condensate at the LERF must be maintained below 13,600 mg/L. To ensure the value of 13,600 mg/L (0.8 M) is not exceeded in the process condensate, a limit of 13,600 x (R-1)/R mg/L is established in the feed to the Evaporator. The term “(R-1)/R” is a correction factor which compensates for concentrating ammonia in the process condensate due to the evaporative process. The value R is the ratio of the feed flow rate divided by the slurry flow rate. Therefore, with a typical R value of 2, the term (R-1)/R would equal 0.5, and the ammonia feed limit would be 6,800 mg/L. This limit (6,800 mg/L) is applied to analyses of samples from the candidate feed tank. Ammonia generally exists as ammonium ion in aqueous solution. The ammonia concentration can be obtained from ammonium ion measurements by scaling according to the molecular weight of each species: Ammonia = (17/18) x (Ammonium mg/L).

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
22a-13	If the highest value for PCB concentrations from the candidate feed tank is <600 µg/L, then the waste can be processed; otherwise, the waste must be evaluated against the 6,000 µg/L limit. If the highest value for PCB concentrations from the candidate feed tank is between 600 µg/L and 6,000 µg/L, then prepare a test plan to validate the Evaporator engineering model, update the risk evaluation of air emissions, and obtain EPA approval to process the waste; otherwise, waste processing is disallowed. Total PCB concentrations will be calculated by summing the concentrations of seven Aroclors (1016, 1221, 1232, 1242, 1248, 1254, and 1260) found in a sample. The total PCB concentration in a sample will be calculated by summing only the detected Aroclors. If no Aroclors are detected, the total PCB concentration is considered the detection limit for the single most common Aroclor expected in the sample (determined to be 1254 in tank waste). This follows EP's procedures for determining the total PCBs in a sample and specified by agreement in a meeting with representatives from EPA Region 10, EPA Manchester Laboratory, State of Washington, Department of Ecology (Ecology), and the U.S. Department of Energy (DOE).	HNF-SD-WM-DQO-014, *242-A Waste Feed Data Quality Objectives (DQO)*	HNF-SD-WM-OCD-015, *Tank Farms Waste transfer Compatibility Program* TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments" TFC-ENG-CHEM-D-23, "Preparation of Tank Sampling and Analysis Plans"	Letter WCM-127, "Approval of the Toxic Substance Control Act (TSCA) Risk-Based Disposal Approval (RBDA) Application for Management of Polychlorinated Biphenyl (PCB) Remediation Waste at the 200 Area Liquid Waste Processing Facilities" WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 4, "242-A Evaporator," Chapter 3, Waste Analysis Plan DOE/RL-2002-02, *Application for Risk-Based Disposal Approval for Polychlorinated Biphenyls – Hanford 200 Area Liquid Waste Processing Facilities* 40 CFR 761, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions" *2001 Framework Agreement for Management of Polychlorinated Biphenyls in Hanford Tank Waste*	Environmental	Not modeled.	A letter, WMC-27, "Approval of the Toxic Substance Control Act (TSCA) Risk-Based Disposal Approval (RBDA) Application for Management of Polychlorinated Biphenyl (PCB) Remediation Waste at the 200 Area Liquid Waste Processing Facilities," established the action limits for the 200 Area Liquid Waste Processing Facilities, which includes the Evaporator. This letter outlines the management of PCB remediation waste based on a risk-based disposal option per 40 CFR 761.61 (c). In order to meet the requirements stated in the letter mentioned above, it is necessary to determine the PCB concentrations in waste entering the Evaporator.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
22a-14	The minimum time for the flammable gas concentration to increase by 25% of the LFL in the headspace of the C-A-1 vessel for planned waste in the C-A-1 vessel shall be ≥ 24 hours calculated using the methodology in RPP-CALC-29700, *Flammability Analysis and Time to Reach Lower Flammability Limit Calculations for the 242-A Evaporator*. (HNF-14755) The analysis of the minimum time for the flammable gas concentration to increase by 25% of the LFL shall assume: • No vacuum and zero ventilation • Waste at the maximum operational level (26,000 gallons) • Waste SpG of 1.6 • Waste temperature of 160 °F • Three drums of antifoam prior to concentration The AC Key Element requirement is the minimum time for the flammable gas concentration to increase by 25% of the lower flammability limit (LFL) in the headspace of the C-A-1 vessel for the planned waste in the C-A-1 vessel shall be ≥ 24 hours calculated using the methodology in RPP-CALC-29700. The analysis of the minimum time for the flammable gas concentration to increase by 25% of the LFL shall assume: * No vacuum and zero ventilation. * Waste at the maximum operational level (26,000 gallons). * Waste specific gravity of 1.6. * A waste temperature of 160 °F * Three drums of antifoam prior to concentration.	HNF-SD-WM-DQO-014, *242-A Waste Feed Data Quality Objectives (DQO)* HNF-14755, *242-A Evaporator Documented Safety Analysis*, Section 5.5.3.1.5 HNF-15279, *242-A Evaporator Technical Safety Requirements*	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments" TFC-ENG-CHEM-D-23, "Preparation of Tank Sampling and Analysis Plans"	RPP-CALC-29700, *The Flammability Analysis and Time to Reach Lower Flammability Limit Calculations for the Waste Evaporation at 242-A Evaporator* HNF-15279, *242-A Evaporator Technical Safety Requirements*	Safety	Not modeled.	
22a-15	A process condensate stream is produced during Evaporator operations and is sent to LERF for treatment. This condensate stream must meet the LERF/Effluent Treatment Facility (ETF) waste acceptance criteria described in HNF-3172, *Liquid Waste Processing Facilities Waste Acceptance Criteria*. (Also see IFPs for interface 25, Secondary Liquid Waste from 242-A Evaporator to LERF/ETF.) To send waste to LERF/ETF, the Evaporator and the Liquid Waste and Fuels Storage (LWFS) organizations conduct a waste acceptance process including the submittal to LWFS of a certified waste stream profile sheet for evaluation against the LERF/ETF waste acceptance criteria before each campaign. Since the Evaporator process does not allow for waiting for process condensate results before discharging to LERF, process knowledge is used to determine if the waste is acceptable for receipt at LERF/ETF prior to the start of each campaign. Process knowledge includes sample results from previous campaigns and organic, ammonia and radionuclide sample results from the feed double-shell tanks, combined with knowledge of partitioning in the Evaporator process. Calculate Process Condensate Ammonia and Organic Concentrations: Ammonia, and volatile organic concentrations are needed for the LERF waste profile sheet (refer to the Permit, Part III, LERF and 200 Area ETF, unit-specific conditions and Chapter 3.0, Waste Analysis Plan.)	HNF-SD-WM-DQO-014, *242-A Waste Feed Data Quality Objectives (DQO)* WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 3, "Liquid Effluent Retention Facility & 200 Area Effluent Treatment Facility," Chapter 3.0, Waste Analysis Plan	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* TFC-ENG-CHEM-C-11, "Process Control Plans" TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 4, "242-A Evaporator," Chapter 3, Waste Analysis Plan 40 CFR 268, "Land Disposal Restrictions"	Environmental Technical	Not modeled.	Process condensate concentrations of targeted organic compounds (e.g., acetone) are estimated to support development of the Process Control Plan. These estimates are needed by the LERF contractor to determine whether receipt of the condensate will trigger the annual cleanout requirement for treatment in surface impoundments, in 40 CFR 268, "Land Disposal Restrictions." The calculation typically assumes all of the ammonia and volatile organics go into the process condensate.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
22a-16	3.2.2.1 Radiological ULD Evaluation The 242-A Evaporator feed is evaluated to verify that the radiological ULDs are bounded by the assumptions used in the DSA. This verification is performed by evaluating ^{90}Sr/^{90}Y, ^{137}Cs, ^{239}Pu, ^{240}Pu and ^{241}Am using the dose conversion factors provided in HNF-IP-1266, Section 5.9.4. Because these isotopes may only account for 95% of the ULDs, the calculated ULDs shall be divided by 0.95 for comparison to the bounding ULDs (for 242-A and DSTs) provided in HNF-IP-1266, Table 5.9.4-4 (provided below) for the 242-A Evaporator. From Table 5.9.4-4 in HNF-IP-1266 ULD Offsite Liquid (Sv/L) : ULD Offsite Solid (Sv/L) : ULD Onsite Liquid (Sv/L) : ULD Onsite Solid (Sv/L) 242-Evaporator 1.5E+3 : 2.9E+5 : 1.0E+3 : 2.0E+5 DSTs 1.5E+3 : 2.9E+5 : 1.0E+3 : 2.0E+5	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* HNF-IP-1266, *Tank Farms Operations Administrative Controls*, Section 5.9.4 – “Waste Characteristics Controls” HNF-SD-WM-TSR-006, *Tank Farms Technical Safety Requirements*, AC 5.9.4, “Waste Characteristics Controls” (AC Key Element)	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* TFC-ENG-CHEM-P-13, “Tank Waste Compatibility Assessments” TFC-ENG-CHEM-D-23, “Preparation of Tank Sampling and Analysis Plans”	HNF-15279, *242-A Evaporator Technical Safety Requirements*, Section 5.9.4 OSD-T-151-00012, *Operating Specifications fort the 242-A Evaporator*, Section 2.1. RPP-5924, *Radiological Source Terms for Tank Farms Safety Analysis* <u>HNF-IP-1266, Table 5.9.4-4 References</u>: RPP-13750, *Waste Transfer Leaks Technical Basis Document*, Attachment A14 RPP-37855, *Technical Basis for the Release from 242-A Facility Due to Fire in Pump and Evaporator Rooms* RPP-47944, *242-A Evaporator Direct Radiation Dose Technical Basis Document* RPP-48050, *Technical Basis for Releases from Deflagration or Detonat+E422ion in the 242-A Evaporator* RPP-49177, *Filtration Failures Leading to Unfiltered Release in the 242-A Evaporator Facility* RPP-CALC-47411, *Technical Basis for Release Events due to Vessel Failure for the 242-A Evaporator Facility* RPP-CALC-47706, *Technical Basis for Sump Jet Release Events for the 242-A Evaporator Facility*	Safety	Not modeled.	
22a-17	3.2.2.2 Toxic Chemical Sum-of-Fractions Evaluation The 242-A Evaporator feed is evaluated to verify that the toxicological USOFs are bounded by the assumptions used in the DSA. This evaluation is performed by calculating the Protective Action Criteria (PAC)-2 and PAC-3 USOFs for the solid and liquid phases of the waste stream, using	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* HNF-IP-1266, *Tank Farms Operations Administrative*	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* TFC-ENG-CHEM-P-13, “Tank Waste Compatibility	HNF-15279, *242-A Evaporator Technical Safety Requirements*, Section 5.9.4 OSD-T-151-00012, *Operating Specifications fort the 242-A*	Safety	Not modeled.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
	equivalent compounds for the analytes shown in Table 3-2 and the methodology described in RPP-30604, *Tank Farms Safety Analyses Chemical Source Term Methodology*. The calculated total USOFs are compared to the bounding USOFs provided in HNF-IP-1266, Table 5.9.4-4 (provided below) for the 242-A Evaporator (for 242-A and DSTs). The analytes used for calculation of the USOF should adequately represent the waste type being transferred. The toxicological USOFs are calculated using an approved spreadsheet. The spreadsheet is documented in SVF-1245, *Waste Compatibility SOF V1.2.xls*, and is described in RPP-31767, *Spreadsheet Description Document for Waste Compatibility SOF V1.2.XLS*. From Table 5.9.4-4 in HNF-IP-1266 USOF PAC-2 Liquid : USOF PAC-2 Solid : USOF PAC-3 Liquid : USOF PAC-3 Solid 242-Evaoporator 3.5E+8 : 3.5E+8 : 1.2E+7 : 2.3E+7 DSTs 4.0E+8 : 5.0E+8 : 1.3E+7 : 6.0E+7	*Controls*, Section 5.9.4, "Waste Characteristics Controls" HNF-SD-WM-TSR-006, *Tank Farms Technical Safety Requirements*, AC 5.9.4, "Waste Characteristics Controls" (AC Key Element)	Assessments" TFC-ENG-CHEM-D-23, "Preparation of Tank Sampling and Analysis Plans"	*Evaporator*, Section 2.1. RPP-5924, *Radiological Source Terms for Tank Farms Safety Analysis* <u>HNF-IP-1266, Table 5.9.4-4 References</u>: RPP-13750, *Waste Transfer Leaks Technical Basis Document*, Attachment A14 RPP-37855, *Technical Basis for the Release from 242-A Facility Due to Fire in Pump and Evaporator Rooms* RPP-47944, *242-A Evaporator Direct Radiation Dose Technical Basis Document* RPP-48050, *Technical Basis for Releases from Deflagration or Detonat+E422ion in the 242-A Evaporator* RPP-49177, *Filtration Failures Leading to Unfiltered Release in the 242-A Evaporator Facility* RPP-CALC-47411, *Technical Basis for Release Events due to Vessel Failure for the 242-A Evaporator Facility* RPP-CALC-47706, *Technical Basis for Sump Jet Release Events for the 242-A Evaporator Facility*			
22a-18	3.2.2.3 Gamma Dose Evaluation The ^{90}Sr concentration is compared to the limiting liquid and solid concentrations listed in HNF-IP-1266, Table 5.9.4-4 for the 242-A Evaporator. The solid ^{137}Cs concentration is compared to the limiting solid concentration listed in HNF-IP-1266, Table 5.9.4-4 for the 242-A Evaporator. Table 5.9.4-4 has a limit for liquid 137Cs; however, a more conservative limit of 800 μCi/mL will be used. This limit is listed in OSD-T-151-00012,	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* HNF-IP-1266, *Tank Farms Operations Administrative Controls*, Section 5.9.4, "Waste Characteristics Controls" HNF-SD-WM-TSR-006, *Tank Farms Technical Safety Requirements*, AC 5.9.4,	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments" TFC-ENG-CHEM-D-23, "Preparation of Tank Sampling and Analysis Plans"	HNF-15279, *242-A Evaporator Technical Safety Requirements*, Section 5.9.4 OSD-T-151-00012, *Operating Specifications fort the 242-A Evaporator*, Section 2.1. RPP-5924, *Radiological Source Terms for Tank Farms Safety Analysis* <u>HNF-IP-1266, Table 5.9.4-4</u>	Safety	Not modeled.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
	Section 2.1 ALARA limits. From Table 5.9.4-4 in HNF-IP-1266 Sr-90 Liquid (Bq/L) : Sr-90 Solid (Bq/L) : Cs-137 Liquid (Bq/L) : Cs-137 Solid (Bq/L) 242-Evaporator 3.0E+9 : 3.0E+12 : 5.7E+10 : 7.0E+10 DSTs 3.0E+9 : 3.0E+12 : 7.0E+10 : 7.0E+10	"Waste Characteristics Controls" (AC Key Element)		References: RPP-13750, *Waste Transfer Leaks Technical Basis Document*, Attachment A14 RPP-37855, *Technical Basis for the Release from 242-A Facility Due to Fire in Pump and Evaporator Rooms* RPP-47944, *242-A Evaporator Direct Radiation Dose Technical Basis Document* RPP-48050, *Technical Basis for Releases from Deflagration or Detonat+E422ion in the 242-A Evaporator* RPP-49177, *Filtration Failures Leading to Unfiltered Release in the 242-A Evaporator Facility* RPP-CALC-47411, *Technical Basis for Release Events due to Vessel Failure for the 242-A Evaporator Facility* RPP-CALC-47706, *Technical Basis for Sump Jet Release Events for the 242-A Evaporator Facility*			

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
22a-19	Antifoam may be added at the 242-A Evaporator during processing. The antifoam is Dow Corning 1520-US and is described in Discussion of Antifoam and Foaming Issues at the 242-A Evaporator, RPP-RPT-33491. The addition of 550 gallons of antifoam is the maximum used in a campaign (242-A Evaporator Campaign 07-01107-02 Post-Run report, RPP-RPT-37727). To conservatively account for the Total Organic Carbon (TOC) added from antifoam, the addition of 550 gallons of antifoam will be assumed for the 242-A campaign slurry receiver tanks.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*, Section 3.2.4	TFC-ENG-CHEM-C-11, "Process Control Plans" TFC-ENG-FACSUP-C-04, "Process Memos"	RPP-RPT-33491, *Discussion of Antifoam and Foaming Issues at the 242-A Evaporator* RPP-RPT-37727, *242-A Evaporator Campaign 07-01107-02 Post-Run report* RPP-21854, *Occurrence and Chemistry of Organic Compounds in Hanford Waste Tanks* RPP-PLAN-55022, *Process Control Plan for 242-A Evaporator Campaigns 13-01 and 14-01* Letter WRPS-1204907, "Criticality Safety Determination Regarding Activities Resulting in Low pH Material Addition to a Tank" CPS-T-149-00012, "Criticality Prevention Specification" RPP-7475, *Criticality Safety Evaluation for Hanford Tank Farms Facility* HNF-14755, *242-A Evaporator Documented Safety Analysis* HNF-15279, *242-A Evaporator Technical Safety Requirements*	Technical	Not modeled. Antifoam not added by HTWOS.	Gap: No split factors or degradation reactions listed for antifoam components. Note: The 550 gallons is not a limit; it is an assumption that is assumed to be bounding. The maximum assumed in the LFL calculation is 165 gallons, but it is not clear how instantaneous versus total used in a batch relates.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
22a-20	If any water or anti-foam agent is being discharged from the 242-A Evaporator Vapor-Liquid Separator (C-A-1) and recirculation loop back to the evaporator's feed tank, the following two criteria must be met: 1) No more than 165 gallons (3 55-gallon drums) of antifoam agent have been injected into the water to be discharged, 2) The pH of the antifoam must be 3.5 or higher.	CPS-T-149-00012, “Criticality Prevention Specification,” Limit 1	TFC-ENG-CHEM-C-11, “Process Control Plans” TFC-ENG-FACSUP-C-04, “Process Memos”	RPP-21854, *Occurrence and Chemistry of Organic Compounds in Hanford Waste Tanks* RPP-PLAN-55022 , *Process Control Plan for 242-A Evaporator Campaigns 13-01 and 14-01* Letter WRPS-1204907, “Criticality Safety Determination Regarding Activities Resulting in Low pH Material Addition to a Tank” CPS-T-149-00012, “Criticality Prevention Specification” RPP-7475, *Criticality Safety Evaluation for Hanford Tank Farms Facility* HNF-14755, *242-A Evaporator Documented Safety Analysis* HNF-15279, *242-A Evaporator Technical Safety Requirements*	Safety	Not modeled.	
22a-21	An evaluation shall be performed and documented for waste transfers from DSTs to determine if an induced gas release due to uncovering solids in the sending DST is sufficient to achieve a flammable gas concentration of 100% of the LFL in the tank headspace assuming zero ventilation. If a flammable gas concentration of 100% of the LFL can be achieved, the volume of liquid waste transferred from the sending DST shall be limited to a volume that prevents achieving 100% of the LFL in the tank headspace.	HNF-SD-WM-TSR-006, *Tank Farms Technical Safety Requirements*, Specific Administrative Control (SAC) 5.8.1, “DST Induced Gas Release Event Evaluation and Limiting Control for Operations (LCO) 3.4, DST Induced Gas Release Event Flammable Gas Control”	TFC-ENG-CHEM-C-11, “Process Control Plans” TFC-ENG-CHEM-P-13, “Tank Waste Compatibility Assessments” TFC-OPS-OPER-C-49, “Development of Waste Retrieval and Transfer Operating Procedures (Including Water and Chemical Additions)”	PNNL-13781, *Effects of Globally Waste-Disturbing Activities on Gas Generation, Retention, and Release in Hanford Waste Tanks* HNF-14755, *242-A Evaporator Documented Safety Analysis* PNNL-13033, *Recharge Data Package for the Immobilized Low-Activity Waste 2001 Performance Assessment*	Safety	Not modeled.	The 13-inch difference between the Normal Operating Limit and the Maximum Authorized Limit provides space for approximately 36,000 gallon 242-A Evaporator dump and flush.
	Interface 22b – Bottoms from 242-A Evaporator to Slurry Receiver DST						

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
22b-1	(Paraphrased) The properties of the 242-A Evaporator slurry stream are: Temperature: 65-150 °F, 200 °F Max Slurry Return Flow rate: 45 gpm (average) with a range of 32 – 110 gpm Specific Gravity: ~1.0 – 1.5, max of 1.6 used in safety calculations Pressure: 80 psig	HNF-14755, *242-A Evaporator Documented Safety Analysis*	None Found	RPP-18465, *Technical Basis for the 242-A Evaporator Operating Specifications* OSD-T-151-00012, *Operating Specifications for the 242-A Evaporator* RPP-TE-52377, *P-B-2 Pump Seal Water Pressure Analysis* RPP-15810, *Enveloping Tank Farm Transfer Pump Power, Discharge Head, and Flow* HNF-15279, *242-A Evaporator Technical Safety Requirements* RPP-CALC-23897, *VFD Driven Induction Motor/Pump Performance Evaluation*	Technical	When processing waste, the minimum slurry rate is assumed to be 30 gpm. The minimum slurry rate is based on estimates of recent 242-A Evaporator performance and reflects the gravity-driven flow rate from the boiler (RPP-17152, *Hanford Tank Waste Operations Simulation (HTWOS) Version 7.7 Model Design Document*, Section 5.3.5). When processing waste, the maximum slurry rate is assumed to be 70 gpm (RPP-17152, Section 5.3.6) Dilute waste will be concentrated until it reaches a bulk concentration of 1.43 g/ml.	
22b-2	The Tank Farm Waste Transfer Compatibility Program (HNF-SD-WM-OCD-015) requires that the potential for plugging of the transfer lines between the 242-A Evaporator and DSTs be addressed in the Process Control Plan. To prevent plugging of the slurry pipeline to AW and AP Tank Farms, the fluid velocity must be greater than the critical velocity, which is defined as the minimum velocity where solids are prevented from settling in the bottom of the pipe.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	TFC-ENG-CHEM-C-11, “Process Control Plans”	“The Critical Velocity in Pipeline Flow of Slurries” (attached to RPP-19221, *Critical Flow Velocity Calculations for Waste Transfer Piping*) RPP-19221, *Critical Flow Velocity Calculations for Waste Transfer Piping* RPP-5346, *Waste Feed Delivery Transfer System Analysis*	Safety	Not modeled.	An equation for critical velocity is given in “The Critical Velocity in Pipeline Flow of Slurries.” The reference is also attached to RPP-19221, *Critical Flow Velocity Calculations for Waste Transfer Piping*. A 30% safety factor is applied to “account for uncertainties in the empirical-based critical velocity correlation and to ensure that the transport velocity is sufficiently greater than the predicted critical velocity to prevent unstable flow conditions that can occur near the critical velocity” (RPP-5346, *Waste Feed Delivery Transfer System*

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
							Analysis).
22b-3	After each Evaporator campaign, the planned and actual transfer will be compared to verify that the fissile material concentration in the returned tank waste is below 0.04 g/l Pu-eq.	CPS-T-149-00012, "Criticality Prevention Specification," Page 7	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	HNF-15000, *CSER-03-008 Criticality Safety Evaluation Report for the 242-A Evaporator Facility*	Safety	Not modeled.	
22b-4	Information required before waste acceptance approval for transfers into the Double-Shell Tank System is provided in Table 2-2 of RPP-29002. This information includes analysis of waste compatibility, which is covered for interface 22b by IFPs 22a-8, 22a-9, 22b-2, 22b-3, 22b-6, 22b-7, and 22b-8.	RPP-29002, *Double-Shell Tank Waste Analysis Plan* HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* HNF-IP-1266, *Tank Farms Operations Administrative Controls* HNF-SD-WM-TSR-006, *Tank Farms Technical Safety Requirements, "*Specific Administrative Control"	TFC-ENG-CHEM-C-11, "Process Control Plans" TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	WAC 173-303, "Dangerous Waste Regulations"	Environmental Safety	Not modeled.	
22b-5	Based on data from the slurry stream sample the source term will be controlled as follows: If the average concentration of each constituent (see Table 4-3) in the slurry stream waste is less than the action limits (bounding source term and inventory limits) for that constituent, then the Evaporator operations can continue; otherwise, initiate recovery activities as listed in HNF-15279, *242-A Evaporator Technical Safety Requirements*. Table 4-3. 242-A Evaporator Source Term Limits Radionuclide : Bounding Source Term (Ci/L) : Inventory Limits (Ci) 90Sr : 2.2E-01 : 2.18E+04 90Y(a) : 2.2E-01 : 2.18E+04 137Cs :1.5E+00 : 1.49E+05 239/240Pu : 1 .6E-04 : 1.58E+01 241Pu : 1 .5E-02 : 1 .49E+03 241Am : 1.0E-03 : 9.90E+01 Total Unit Liter Dose : 1 .96E+00 : 1 .94E+05 Notes: (a) 90Y is calculated from 90Sr analysis.	HNF-SD-WM-DQO-014, *242-A Waste Feed Data Quality Objectives (DQO)* HNF-14755, *242-A Evaporator Documented Safety Analysis*	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments" TFC-ENG-CHEM-D-23, "Preparation of Tank Sampling and Analysis Plans"	HNF-15279, *242-A Evaporator Technical Safety Requirements* WHC-SD-SQA-ANAL-20001, *MCNPH Calculated Gamma Dose at the 242-A Evaporator Building* WHC-SD-SQA-ANAL-20002, *Calculated Gamma Radiation at 242-A Evaporator's Area Radiation Monitors and Gamma Contour Plots at Selected Elevations*	Safety	Modeled. HTWOS limits the evaporator operation to 80% of the source term.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
22b-6	A gas release event evaluation shall be performed and documented for the following water additions, chemical additions, and waste transfers into DSTs. • Additions of > 20,000 gal of water when the resulting waste level in the receiving DST will be ≤ 422 in. • Additions of > 10,000 gal of water when the resulting waste level in the receiving DST will be > 422 in. • Additions of > 20,000 gal of sodium hydroxide or sodium nitrite when the resulting waste level in the receiving DST will be ≤ 422 in. • Additions of > 10,000 gal of sodium hydroxide or sodium nitrite when the resulting waste level in the receiving DST will be > 422 in. • Transfers of > 20,000 gal of waste when the resulting waste level in the receiving DST will be ≤ 422 in. • Transfers of > 10,000 gal of waste when the resulting waste level in the receiving DST will be > 422 in. The evaluation shall determine if an induced gas release due to the dissolution of soluble settled solids in the receiving DST is sufficient to achieve a flammable gas concentration of 100% of the LFL in the tank headspace assuming zero ventilation. If a flammable gas concentration of 100% of the LFL can be achieved, LCO 3.4, "DST Induced Gas Release Event Flammable Gas Control," shall be implemented during the water addition, chemical addition, or waste transfer.	HNF-SD-WM-TSR-006, *Tank Farms Technical Safety Requirements*, Specific Administrative Control (SAC) 5.8.1, "DST Induced Gas Release Event Evaluation and Limiting Control for Operations (LCO) 3.4, DST Induced Gas Release Event Flammable Gas Control"	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments" TFC-OPS-OPER-C-49, "Development of Waste Retrieval and Transfer Operating Procedures (Including Water and Chemical Additions)"	PNNL-13781, *Effects of Globally Waste-Disturbing Activities on Gas Generation, Retention, and Release in Hanford Waste Tanks* RPP-13033, *Tank Farms Documented Safety Analysis*	Safety	Not modeled.	See RPP-13033, *Tank Farms Documented Safety Analysis*, Chapter 4.0, "Safety Structures, Systems, and Components," Section 4.5.3, "DST Induced Gas Release Event Flammable Gas Controls," for additional information.
22b-7	Prior to the following activities, an evaluation shall be performed and documented that identifies any requirements to prevent the formation of waste gel in a DST or SST, and any identified requirements shall be implemented in the waste retrieval or transfer operating procedures for the activities. a. Waste transfers to DSTs and SSTs. b. Chemical additions of sodium hydroxide or sodium nitrite to DSTs for waste chemistry management. c. Chemical additions of sodium hydroxide to 100-series SSTs to support waste retrieval.	HNF-SD-WM-TSR-006, *Tank Farms Technical Safety Requirements*, AC 5.9.4, "Waste Characteristics Controls" (AC Key Element)	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments" TFC-OPS-OPER-C-49, "Development of Waste Retrieval and Transfer Operating Procedures (Including Water and Chemical Additions)"	RPP-23600, *Phosphate Solubility Technical Basis*	Safety	Not modeled.	See RPP-13033, *Tank Farms Documented Safety Analysis*, Chapter 5.0, "Derivation of Technical Safety Requirements," Section 5.5.3.4, "Administrative Control 5.9.4 – Waste Characteristics Controls," for additional information.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
22b-8	Controlled parameters for waste (i.e., minimum pH, minimum neutron absorber to plutonium mass ratio, and maximum plutonium concentration) shall be established and maintained for tank farm operations [e.g., tank-to-tank waste transfers, single-shell tank retrievals (including all retrieval methodologies), waste transfers to and from the 242-A Evaporator].	HNF-SD-WM-TSR-006, *Tank Farms Technical Safety Requirements*, AC 5.9.5, "Nuclear Criticality Safety" (AC Key Element)	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	RPP-7475, *Criticality Safety Evaluation for Hanford Tank Farms Facility* CPS-T-149-00012, "Criticality Prevention Specification"	Safety	Not modeled.	See RPP-13033, *Tank Farms Documented Safety Analysis*, Chapter 5.0, "Derivation of Technical Safety Requirements," Section 5.5.3.5, "Administrative Control 5.9.5 – Nuclear Criticality Safety," for additional information. CSERs establish the allowable waste pH, neutron absorber to plutonium mass ratio, and plutonium concentration to ensure a large margin for subcriticality for evaluated tank farm operations. The limits on waste pH, neutron absorber to plutonium mass ratio, and plutonium concentration established in the CSERs are contained in CPS-T-149-00012, "Criticality Prevention Specification."

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
22b-9	The final state of source and receiver DSTs must be evaluated for compliance with tank chemistry controls. DST waste chemistry limits are given in Table 3-9 (reproduced here). The receipt or transfer of waste that does not meet chemistry control limits can occur only if the receiving DST will remain within specification limits after the transfer or as part of actions for the mitigation of out-of-specification waste. Table 3-9. Waste Chemistry Limits for All DST's Waste except 241-AN-102, AN-106, AN-107, AY-101, and AY-102 Interstitial Liquids FOR $[NO_3^-]$ RANGE : FOR WASTE TEMPERATURE (T) RANGE : VARIABLE $[NO_3^-] \le 1.0M$: $T < 167\ °F$: $0.010M \le [OH^-] \le 8.0M$ $[NO_3^-] \le 1.0M$: $167\ °F \le T \le 212\ °F$: $0.010M \le [OH^-] \le 5.0M$ $[NO_3^-] \le 1.0M$: $T > 212\ °F$: $0.010M \le [OH^-] < 4.0M$ $[NO_3^-] \le 1.0M$: $T < 167\ °F$, $167\ °F \le T \le 212\ °F$, $T > 212\ °F$: $0.011M \le [NO_2\text{-}] \le 5.5M$ $[NO_3^-] \le 1.0M$:$T < 167\ °F$, $167\ °F \le T \le 212\ °F$, $T > 212\ °F$: $[NO_3^-]/([OH^-] + [NO_2^-]) < 2.5M$ $1.0M < [NO_3^-] \le 3.0M$: $T < 167\ °F$: $0.1([NO_3^-]) \le [OH^-] < 10M$ $1.0M < NO_3^-] \le 3.0M$: $167\ °F \le T \le 212\ °F$: $0.1([NO_3^-]) \le [OH^-] < 10M$ $1.0M < [NO_3^-] \le 3.0M$: $T > 212\ °F$: $0.1([NO_3^-]) \le [OH\text{-}] < 4.0M$ $1.0M < [NO_3^-] \le 3.0M$: $T < 167\ °F$, $167\ °F \le T \le 212\ °F$, $T > 212\ °F$: $[OH^-] + [NO_2^-] \ge 0.4([NO_3^-])$ $[NO_3^-] > 3.0M$: $T < 167\ °F$: $0.3M \le [OH^-] < 10M$ $[NO_3^-] > 3.0M$: $167\ °F \le T \le 212\ °F$: $0.3M \le [OH^-] < 10M$ $[NO_3^-] > 3.0M$: $T > 212\ °F$: $0.3M \le [OH^-] < 4.0M$ $[NO_3^-] > 3.0M$: $T < 167\ °F$, $167\ °F \le T \le 212\ °F$, $T > 212\ °F$: $[OH^-] + [NO_2^-] \ge 1.2M$ $[NO_3^-] > 3.0M$: $T < 167\ °F$, $167\ °F \le T \le 212\ °F$, $T > 212\ °F$: $[NO_3^-] \le 5.5M$	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	TFC-ENG-CHEM-P-13, "Tank Waste Compatibility Assessments"	None found.	Technical	Not modeled.	
22b-10	See IFPs 22a-7, 22a-15, 22a-16, 22a-17, and 22a-18 for additional information on 22b IFPs.	N/A	N/A	N/A	N/A	N/A	
	Interface 23 – Offgas from 242-A Evaporator to Stack (Release to environment)						

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
23-1	The total abated emission limit for this Notice of Construction is limited to 5.00E-07 mrem/year to the Maximally Exposed Individual [WAC 246-247-040(5), "Radiation Protection – General standards"]. The total limit on the Potential-To-Emit for this NOC is limited to 1.00E-03 mrem/year to the Maximally Exposed Individual [WAC 246-247-030(21), "Radiation Protection – Definitions"].	Hanford Radioactive Air Emission License, FF-1, Attachment 2 of *Site Air Operating Permit No. 00-05-006*	3-VBP-657, *242-A Evaporator Stacks Air Flow Test* TO-620-020, *Operate the 242-A Evaporator Ventilation System*	WAC 246-247-040(5), "Radiation Protection – Air Emissions – General Standards" WAC 246-247-030(21), "Radiation Protection – Air Emissions – Definitions"	Environmental	Not modeled.	State only enforceable. Monitoring and Testing Requirements: During campaigns: 40 CFR 60, "Standards of Performance for New Stationary Sources," Appendix A, Method 2; 40 CFR 61, "National Emission Standards for Hazardous Air Pollutants," Appendix B, Method 114. During non-campaigns: 40 CFR 61, Appendix B, Method 114(3). Radionuclides Requiring Measurement: Campaign: TOTAL ALPHA, TOTAL BETA, ^{137}Cs, ^{90}Sr, ^{239}Pu, ^{238}Pu, and ^{241}Am. Non-Campaign: Total Alpha, Total Beta. Sampling Frequency: One week sample per quarter, and continuous sampling during campaign.
23-2	Changes to the 242-A evaporator that are outside the activities described below will require a permit modification. No additional activities or variations on the approved activities that constitute a "modification" to the emission unit, as defined in WAC 246-247-030(16), , "Radiation Protection – Definitions," may be conducted. The 242-A Evaporator facility is used to reduce the volume of waste solutions that do not self-boil, and thus reduce the number of underground double-shell tanks required for waste storage. The 242-A Evaporator employs a conventional forced-circulation, vacuum evaporation system to concentrate radioactive waste solutions. Principal process components of the evaporator system are located in the 242-A Building. They include the reboiler, vapor-liquid separator, recirculation pump and pipe loop, slurry product pump, condensers, and vessel ventilation system.	Hanford Radioactive Air Emission License, FF-1, Attachment 2 of *Site Air Operating Permit No. 00-05-006*	None identified.	None identified.	Environmental	Not modeled.	State only enforceable.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
	The evaporator system receives a mixed blend feed from the feed tank. The feed consists of unprocessed and processed waste and recycled liquid that are removed from storage tanks after solids have settled. The feed is pumped into the recirculation line and blended with the main product slurry stream, which flows to the reboiler via the recirculation pump. The mixture is heated in the reboiler. The vapor liquid separator is maintained at a reduced pressure. Under this reduced pressure, a fraction of the water in the heated slurry flashes to steam and is drawn through two wire mesh deentrainer pads into a vapor line that leads to the primary condenser. As evaporation takes place in the separator vessel, the slurry becomes concentrated. When the process solution has been concentrated to the parameters specified by the campaigns process memo, a fraction is withdrawn from the upper recirculation line, upstream of the feed addition point, and is either gravity drained or pumped by the slurry pump to underground storage tanks. Vapors removed from the vapor-liquid separator via the vapor line are condensed and routed to the condensate collection tank. The process condensate is discharged to the Liquid Effluent Retention Facility (LERF). Steam condensate is continuously monitored for excessive radiation, pH, and conductivity, and then discharged from the building to the 200 Area Treated Effluent Disposal Facility (TEDF). Upon detection of radioactive contamination, the radiation monitor will automatically divert the steam condensate stream to the feed tank. Cooling water from the condensers, which is also continuously monitored for excessive radiation, pH, and conductivity, is also discharged to the 200 Area TEDF. This used cooling water stream cannot be diverted, thus, if contamination is detected, an evaporator shutdown is required. Non-condensable vapors from the evaporator are filtered and discharged to the atmosphere via the vessel vent system. This system consists of a deentrainment pad, prefilter, heater, high-efficiency filter assembly, and vessel vent exhauster.						

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
23-3	The Annual Possession Quantity is limited to the radionuclides identified in Attachment 2 of the *Site Air Operating Permit 00-05-006* and are listed here for reference (Curies/year): Am-241 3.50E+04 I C-14 1.80E+05 I Cm-244 4.50E+02 Co-60 4.20E+04 I Cs-134 5.20E+05 I Cs-137 5.20E+07 Eu-154 1.70E+05 I Eu-155 2.40E+05 I I-129 9.10E+01 Nb-94 3.40E+03 I Pu-238 4.50E+01 I Pu-239/240 5.60E+03 Pu-241 5.20E+05 I Ra-226 1.10E+03 I Ru-106 1.80E+06 Se-79 2.70E+03 I Sr-90 7.70E+06 I Tc-99 7.00E+04	Hanford Radioactive Air Emission License, FF-1, Attachment 2 of *Site Air Operating Permit No. 00-05-006*	3-VBP-657, *242-A Evaporator Stacks Air Flow Test* TO-620-020, *Operate the 242-A Evaporator Ventilation System*	None identified.	Environmental	Not modeled.	State only enforceable. Monitoring and Testing Requirements: During campaigns: 40 CFR 60, "Standards of Performance for New Stationary Sources," Appendix A, Method 2; 40 CFR 61, "National Emission Standards for Hazardous Air Pollutants," Appendix B, Method 114. During non-campaigns: 40 CFR 61, Appendix B, Method 114(3). Radionuclides Requiring Measurement: Campaign: TOTAL ALPHA, TOTAL BETA, ^{137}Cs, ^{90}Sr, ^{239}Pu, ^{238}Pu, and ^{241}Am. Non-Campaign: Total Alpha, Total Beta. Sampling Frequency: One week sample per quarter, and continuous sampling during campaign.
23-4	Average stack exhaust velocity for Stack 296-A-22 is 33.43 ft/s. Average stack effluent Temperature: 120 °F	*Hanford Radioactive Air Emission License*, FF-1, , Attachment 2 of *Site Air Operating Permit No. 00-05-006*	TO-620-020, *Operate the 242-A Evaporator Ventilation System* 3-VBP-657, *242-A Evaporator Stacks Air Flow Test*	None identified.	N/A	Only waste component masses are tracked; exhaust velocity and volume are not tracked or modeled.	
23-5	The CERCLA Reportable Quantity for gaseous ammonia discharge to the environment is 100 lb in a 24-hr period. If the vessel vent ammonia monitor indicates the ammonia discharge level may exceed 50 lbs/24 hrs if no action is taken, then engineering is notified to trend and evaluate the discharge and, if required, provide appropriate process direction to lower the ammonia discharge levels; otherwise no action is needed. Approximately 5% of the ammonia in the feed is not condensed and is discharged through the vessel ventilation stack.	HNF-14755, *242-A Evaporator Documented Safety Analysis*, Pages 2-27, 2-68, and 2-90 HNF-SD-WM-DQO-014, *242-A Waste Feed Data Quality Objectives (DQO)*	TO-620-200, *Vessel Vent Ammonia Monitor* TFC-ENG-CHEM-C-11, "Process Control Plans"	WHC-SD-WM-PE-054, *242-A Campaign 94-2 Post Run Document* 40 CFR 302, "Designation, Reportable Quantities, and Notification"	Environmental	Not modeled.	This is related to IFP 22a-2. The limitations on the amount of ammonia processed during an Evaporator campaign are determined by LERF requirements established in prior safety analyses and vessel vent discharge limits governed by 40 CFR 302, "Designation, Reportable Quantities, and

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
							Notification.” The action limit for the vessel vent is a CERCLA ammonia reportable quantity discharge value of 100 lbs/24 hrs. However, to avoid going over this limit, action is taken if the ammonia monitor indicates the ammonia discharge level may exceed 50 lbs/ 24 hrs.
23-6	The process vent at the 242-A Evaporator is subject to 40 CFR 264, Subpart AA, which requires organic emissions be limited to 1.4 kilograms per hour, and 2.8 mega grams per year, or controls be installed to reduce organic emissions by 95 percent. Organic concentrations in the waste processed at the 242-A Evaporator are limited to ensure the values of 1.4 kilograms per hour and 2.8 mega grams per year are not exceeded. This same requirement can be stated as “Facilities having process vents associated with distillation units that process wastes with greater than 10 ppm organic must maintain organic emissions below 3.0 lbs/hr and 6200 lbs/yr.” See IFP 22a-5 for additional details.	WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 4, “242-A Evaporator,” Chapter 6, Procedures to Prevent Hazards, Section 6.2.4, Air Emissions Control and Detection Inspections WAC-173-303, “Dangerous Waste Regulations,” Section 690, “Air Emission Standards for Process Vents”	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* TFC-ENG-CHEM-P-13, “Tank Waste Compatibility Assessments” TFC-ENG-CHEM-C-11, “Process Control Plans”	40 CFR 264.1032, “Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities,” Standards: Process Vents 40 CFR 264, Subpart AA, “Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities”	Environmental	Not modeled.	Emission rates may be determined by measurement or engineering calculations.
23-7	An evaluation must be made to determine which radionuclides contribute greater than 10% of the potential-to-emit in order to comply with analysis for total alpha, total beta, ^{137}Cs, ^{90}Sr, ^{239}Pu, ^{238}Pu, ^{241}Am, and any other radionuclide that contributes more than 10% of the potential-to-emit at a WDOH specified a sampling frequency of one week sample per quarter and continuous sampling during a campaign.	Air Operating Permit (WDOH 2001)	TFC-ENG-CHEM-C-11, “Process Control Plans”	Memorandum 31230-98-001, “Facility Effluent Monitoring Plan for the 242-A Evaporator Facility” (for release factor) HNF-3602, *Calculating Potential-to-Emit Releases and Doses for FEMPs and NOCs*, Table 4-9 (for dose factors)	Environmental	Not modeled.	WDOH imposed sampling requirements specific to the 242-A Evaporator as part of an approval to downgrade requirements for the vessel vent stack, 296-A-22. These sampling requirements are included in the Air Operating Permit (WDOH 2001).
	Interface 24 – Wastewater from 242-A Evaporator to TEDF						
24-1	(Paraphrased) The properties of the 242-A Evaporator steam condensate stream are: Temperature: 90-160 °F Flow rate: 80 gpm (average), 180 gpm maximum Specific Gravity: 1.0	HNF-14755, *242-A Evaporator Documented Safety Analysis*, Table 2-1	None Found	HNF-SD-W049H-ICD-001, *200 Area Treated Effluent Disposal Facility Interface Control Document*, Appendix D (applies to flow rate)	Operations	Flow rate of condensate tracked as the condensate is generated.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
24-2	(Paraphrased) The properties of the 242-A Evaporator cooling water stream are: Temperature: 35-75 °F Flow rate: 2,640 gpm (typical), 3,650 gpm maximum Specific Gravity: 1.0	HNF-SD-W049H-ICD-001, *200 Area Treated Effluent Disposal Facility Interface Control Document*, Appendix C (applies to flow rate)	None Found	HNF-SD-W049H-ICD-001, *200 Area Treated Effluent Disposal Facility Interface Control Document*, Appendix C (applies to flow rate)	Operations	Condensate cooling water is not modeled.	
24-3	on-line pH between 6.5 and 9.0 for 242-A evaporator cooling water and on-line pH between 5.5 and 8.5 for 242-A evaporator steam condensate	HNF-SD-W049H-ICD-001, *200 Area Treated Effluent Disposal Facility Interface Control Document*	TFC-ENG-CHEM-C-11, "Process Control Plans" RPP-16922, *Environmental Speciation Requirements*, Section 7.3.2.1	ST 4502, *State Waste Discharge Permit Number ST 4502*	Operation	Not modeled.	Upper pH limit for 242-A evaporator cooling water is set at 9.0 since raw water, which makes up this interface, is often above 8.5.
24-4	on-line flow monitoring requirement: * Maximum flow for the evaporator cooling water = 3700 gpm based on 4-hour average * Maximum flow for the evaporator steam condensate = 180 gpm based on 4-hour average	HNF-SD-W049H-ICD-001, *200 Area Treated Effluent Disposal Facility Interface Control Document*	TFC-ENG-CHEM-C-11, "Process Control Plans" RPP-16922, *Environmental Speciation Requirements*, Section 7.3.2.1	ST 4502, *State Waste Discharge Permit Number ST 4502*	Operation	Not modeled.	Max flow rate limit for evaporator cooling water seems high (3700 gpm), but this is the maximum flow that could be generated by all 242-A evaporator cooling water sources. The flow rates (gpm) are based on total annual flow divided by 525,600 min (1 year).
24-5	Meet the TEDF generating facilities sampling and analytical requirements as shown in Table 3 at the frequency listed in Table 4 of HNF-SD-W049-ICD-001, *200 Area Treated Effluent Disposal Facility Interface Control Document*. The limits from Table 3 are listed here for reference. Chloride : 58,000 µg/L Nitrate : 620 µg/L Sulfate : No Target Limit Arsenic (Total) : 15 µg/L Cadmium (Total) : 5 µg/L Chromium (Total) : 20 µg/L Iron (Total) : 300 µg/L Lead (Total) : 10 µg/L Manganese (Total) : 50 µg/L Mercury (Total) : 2 µg/L Total Dissolved Solids : 500,000 µg/L Gross alpha : 15 pCi/L Gross beta : 50 pCi/L 4 Bis (2-ethylhexyl phthalate) : 10 µg/L Carbon tetrachloride : 5 µg/L Chloroform : 7 µg/L Methylene chloride : 5 µg/L Trihalomethanes (Total) : 20 µg/L	HNF-SD-W049H-ICD-001, *200 Area Treated Effluent Disposal Facility Interface Control Document*	TFC-ENG-CHEM-C-11, "Process Control Plans"	ST 4502, *State Waste Discharge Permit Number ST 4502* (best available technology/all known, available, and reasonable treatment)	Environmental	Not modeled.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
	Interface 25 – Secondary liquid waste from 242-A Evaporator to LERF/ETF						
25-1	(Paraphrased) The properties of the 242-A Evaporator process condensate stream are: Temperature: 80-110 °F Flow rate: 50 gpm (average) with a range of 20-60 gpm Specific Gravity: 1.0	HNF-14755, *242-A Evaporator Documented Safety Analysis*, Table 2-1	None Found	None Found	Operations	Volume and waste components tracked; SpG = 1.0.	
25-2	Wastewater must be in compliance with the Final Delisting levels both inorganic and organic constituents listed in Table 2 of the EPA 40 CRF 261, Appendix IX Delisting Levels: All total constituent concentrations in treated effluents managed under this exclusion must be equal to or less than the following levels, expressed as mg/L: Inorganic Constituents Ammonia—6.0; Barium—1.6; Beryllium—4.5 × 10−2; Nickel—4.5×10^{-1}; Silver—1.1×10^{-1}; Vanadium—1.6×10^{-1}; Zinc—6.8; Arsenic—1.5×10^{-2}; Cadmium—1.1×10^{-2}; Chromium—6.8×10^{-2}; Lead—9.0×10^{-2}; Mercury—6.8×10^{-3}; Selenium—1.1×10^{-1}; Fluoride—1.2; Cyanides—4.8×10^{-1} Organic Constituents: Cresol—1.2; 2,4,6 Trichlorophenol—3.6×10^{-1}; Benzene—6.0×10^{-2}; Chrysene—5.6×10^{-1}; Hexachlorobenzne—2.0×10^{-3}; Hexachlorocyclopentadiene—1.8 × 10−1; Dichloroisopropyl ether; [Bis(2-Chloroisopropyl) either]—6.0×10^{-2}; Di-n-octylphthalate—4.8×10^{-1}; 1-Butanol—2.4; Isophorone—4.2; Diphenylamine—5.6×10^{-1}; p-Chloroaniline—1.2×10^{-1}; Acetonitrile—1.2; Carbazole—1.8×10^{-1}; N-Nitrosodimethylamine—2.0×10^{-2}; Pyridine—$2.4 \times 10^{-2;}$ Lindane [gamma-BHC]—3.0×10^{-3}; Aroclor [total of Aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260]—5.0×10^{-4}; Carbon tetrachloride—1.8×10^{-2}; Tetrahydrofuran—$5.6 \times 10^{-}1$; Acetone—2.4; Carbon disulfide—2.3; Tributyl phosphate—1.2×10^{-1}	HNF-3172, *Liquid Waste Processing Facilities Waste Acceptance Criteria*	TFC-ENG-CHEM-C-11, "Process Control Plans" To send waste to LERF/ETF, the Evaporator and the Effluent Treatment Facility Operations (ETFO) organizations conduct a waste acceptance process including the submittal to ETFO of a certified waste stream profile sheet for evaluation against the LERF/ETF waste acceptance criteria before each campaign. Process knowledge is used to determine if the waste is acceptable for receipt at LERF/ETF prior to the start of each campaign. ETFO will then transmit a letter to the Evaporator on the Waste Acceptance Approval.	40 CFR 261, "Identification and Listing of Hazardous Waste," Appendix IX, Table 2	Environmental	Not modeled.	
25-3	The TSCA Risk-Based Disposal Approval (RBDA) imposes two limits on total PCBs that can be accepted at LERF/ETF. The upper limit is 6000 µg/L total PCBs in any waste. Exceeding the action limit of 600 µg/L total PCBs in any waste managed at LERF/ETF requires an update of the air emission risk evaluation before the waste can be managed at LERF/ETF.	HNF-3172, *Liquid Waste Processing Facilities Waste Acceptance Criteria*	TFC-ENG-CHEM-C-11, "Process Control Plans"	EPA letter WCM-127, "Approval of the Toxic Substances Control Act (TSCA) Risk-Based Disposal Approval (RBDA) Application for the Management of Polychlorinated Biphenyl (PCB) Remediation Waste at the 200 Area Liquid Waste Processing Facilities"	Environmental	Not modeled.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
25-4	LERF and ETF are classified as below hazard Category 3 facilities. Wastewater accepted at the LERF will be controlled so that the wastewater dose consequence does not exceed that of the maximum bounding radiological source term listed in the Table D-1 (LERF Maximum Bounding Radiological Source Term) of HNF-3172, *Liquid Waste Processing Facilities Waste Acceptance Criteria*, which has been reproduced here for reference with concentrations in Ci/L. Tritium : 2.4 E-04 Carbon-14 : 1.6 E-06 Cobalt-60 : 2.4 E-06 Selenium-79 : 1.5 E-07 Strontium-90 : 4.2 E-05 Niobium-94 : 2.6 E-07 Technetium-99 : 1.8 E-05 Ruthenium-106 : 6.5 E-07 Iodine-129 : 1.8 E-06 Cesium-134 : 4.1 E-07 Cesium-137 : 1.0E-05 Cerium-144 : 2.0E-05 Europium-154 : 9.8 E-06 Europium-155 : 6.3 E-05 Radium-226 : 6.4 E-08 Uranium (gross) (as Ur-234) : 2.1 E-10 Neptunium-237 : 2.1 E-09 Plutonium-238 : 2.8 E-09 Plutonium-239/240 : 1.8E-08 Plutonium-241 : 2.6 E-08 Americium-241 : 1.4 E-09 Curium-244 : 2.5 E-08	HNF-3172, ,*Liquid Waste Processing Facilities Waste Acceptance Criteria* HNF-SD-WM-DQO-014, *242-A Waste Feed Data Quality Objectives (DQO)*	TFC-ENG-CHEM-C-11, “Process Control Plans” To send waste to LERF/ETF, the Evaporator and the Effluent Treatment Facility Operations (ETFO) organizations conduct a waste acceptance process including the submittal to ETFO of a certified waste stream profile sheet for evaluation against the LERF/ETF waste acceptance criteria before each campaign. Process knowledge is used to determine if the waste is acceptable for receipt at LERF/ETF prior to the start of each campaign. ETFO will then transmit a letter to the Evaporator on the Waste Acceptance Approval.	HNF-SD-LEF-ASA-002, *242AL Liquid Effluent Retention Facility Auditable Safety Analysis* HNF-SD-ETF-ASA-001, *200 Area Effluent Treatment Facility Auditable Safety Analysis Report* WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 4, “242-A Evaporator,” Chapter 3, Waste Analysis Plan, Section 3.7, Candidate Feed Tank Waste Acceptance Process HNF-SD-WM-SAD-040, *Liquid Effluent Retention Facility Final Hazard Category Determination*	Safety	Not modeled.	Individual radionuclide concentrations in the incoming wastewater may exceed the defined maximum bounding concentration provided the dose consequence associated with the wastewater is less than or equal to the dose consequence limits defined by the LERF Hazard Category Determination.
25-5	To prevent solids accumulation in the LERF basins, wastewaters are required to be filtered through a 5 micron (nominal) filter before receipt at the LERF/ETF, unless a waiver from ETFO (200 Area Effluent Treatment Facility Operations) is obtained. The required filter micron sizing maybe less than 5 depending on the characteristics of the solids (e.g., colloidal) in the wastewater.	HNF-3172, ,*Liquid Waste Processing Facilities Waste Acceptance Criteria*	TFC-ENG-CHEM-C-11, “Process Control Plans” TFC-ENG-CHEM-P-13, “Tank Waste Compatibility Assessments”	None found.	Operation	Not modeled.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
25-6	To protect the integrity of the LERF liners, the compatibility of a wastewater with the liner materials must be confirmed prior to wastewater receipt. Table E-1 of HNF-3172, which is reproduced here, lists several constituents and parameters that are potentially harmful (at high concentrations) to the integrity of the liners. Chemical family : Constituent(s) or parameter(s) : Limit (mg/L) Alcohol/glycol : 1-butanol : 500,000 Alkanone (ketone containing saturated alkyl group(s)) : acetone : 200,000 Alkenone(ketone containing unsaturated alkyl group(s)) : none targeted : NA Aromatic/cyclic hydrocarbon : acetophenone, benzene, carbozole, chrysene, cresol, di-n-octyl phthalate, diphenylamine, isophorone, pyridine, tetrahydrofuran : 2,000 Halogenated hydrocarbon : Aroclors, carbon tetrachloride, chloroform, hexachlorobenzene, lindane (gamma-BHC), hexachlorocyclopentadiene, methylene chloride, p-chloroaniline, tetrachloroethylene, 2,4,6-trichlorophenol : 2,000 Aliphatic hydrocarbon : none targeted : NA Ether : dichloroisopropyl ether : 2,000 Other hydrocarbons : acetontrile, carbon disulfide, n-nitrosodimethylamine, tributyl phosphate : 2,000 Oxidizers : none targeted : NA Acids, bases, salts : ammonia, cyanide, anions, cations : 100,000 pH : PH : 0.5 < pH < 13.0	HNF-3172, *Liquid Waste Processing Facilities Waste Acceptance Criteria* HNF-SD-WM-DQO-014, *242-A Waste Feed Data Quality Objectives (DQO)*	TFC-ENG-CHEM-C-11, "Process Control Plans" To send waste to LERF/ETF, the Evaporator and the Effluent Treatment Facility Operations (ETFO) organizations conduct a waste acceptance process including the submittal to ETFO of a certified waste stream profile sheet for evaluation against the LERF/ETF waste acceptance criteria before each campaign. Process knowledge is used to determine if the waste is acceptable for receipt at LERF/ETF prior to the start of each campaign. ETFO will then transmit a letter to the Evaporator on the Waste Acceptance Approval.	None found.	Operation	Not modeled.	The constituents of concern for liner compatibility were developed based on compatibility testing and vendor data of the liner materials. Several constituents and parameters were identified as potentially harmful (at high concentrations) to the integrity of the liners. From these data and the application of safety factors, the concentration limits in Appendix E were established. Analytical data for a chemical family are summed using the following sum-of-fractions technique. The individual constituent concentrations, sum concentrations (for families), and pH values for a wastewater are then evaluated against the compatibility limit. i Σ (concn/Limitn) ≤ 1 n=1 where 'i' is the number of constituents in the chemical family that were detected.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
25-7	To prevent scaling of the reverse osmosis membrane surface, the operation of the unit is controlled so solubility limits are not exceeded. This can be done by evaluating the concentration of scaling compounds (such as barium sulfate, calcium sulfate) in the feed and by adding anti-scaling compounds to the feed stream. A nominal upper feed limit of 0.5 wt.% dissolved solids is applied for the reverse osmosis unit.	HNF-3172, *Liquid Waste Processing Facilities Waste Acceptance Criteria*	To send waste to LERF/ETF, the Evaporator and the Effluent Treatment Facility Operations (ETFO) organizations conduct a waste acceptance process including the submittal to ETFO of a certified waste stream profile sheet for evaluation against the LERF/ETF waste acceptance criteria before each campaign. Process knowledge is used to determine if the waste is acceptable for receipt at LERF/ETF prior to the start of each campaign. ETFO will then transmit a letter to the Evaporator on the Waste Acceptance Approval.	HNF-3172, *Liquid Waste Processing Facilities Waste Acceptance Criteria*	Operation	Not modeled.	
25-8	High chloride and high fluoride levels are concern for the ETF material of constructions. The secondary treatment train can be operated under acidic conditions or caustic conditions depending on the nature of the waste being treated. The maximum combined chloride/fluoride level in the evaporator brine under acidic conditions is 760 ppm (letter 96-AFC-86230-0010, “Final RCRA Information Needs Report”) while this limit is up to 10,000 ppm under caustic conditions (1998-09-30 LETTER – [1111301287]). The actual level of chlorides/fluorides that may be accepted in the wastewater is determined by how the wastewater will be processed through the ETF, and must be evaluated on a case-by-case basis.	HNF-3172, *Liquid Waste Processing Facilities Waste Acceptance Criteria*	TFC-ENG-CHEM-C-11, “Process Control Plans” To send waste to LERF/ETF, the Evaporator and the Effluent Treatment Facility Operations (ETFO) organizations conduct a waste acceptance process including the submittal to ETFO of a certified waste stream profile sheet for evaluation against the LERF/ETF waste acceptance criteria before each campaign. Process knowledge is used to determine if the waste is acceptable for receipt at LERF/ETF prior to the start of each campaign. ETFO will then transmit a letter to the Evaporator on the Waste Acceptance Approval.	Memorandum 96-AFC-86230-0010, “Final RCRA Information Needs Report,” Section 2.0 Letter 1998-09-30 LETTER – [1111301287], (letter from J. R. Divine, ChemMet, Ltd. to K. J. Lueck, Waste Management Federal Services of Hanford, Inc., September 30, 1998)	Operation	Not modeled.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
25-9	The LERF/ETF can only accept wastewaters with waste codes given in Table 2. Table 2: LERF/ETF Approved Waste Codes. Listed Waste Codes : Characteristic Waste Codes : State-Only Waste Codes F001 – F005 : D001 – D011, D018 : WT01 F039 : D019, D022 : WT02 U210 : D028 – D030, D033 – D036 D038 – D041, D043 Acceptance of those F- and U- listed waste codes that have a treatment standard established for wastewater forms of F039 multi-source leachate under 40 CFR 268.40, “Applicability of Treatment Standards,” will be handled on a case-by-case basis.	HNF-3172, *Liquid Waste Processing Facilities Waste Acceptance Criteria*	TFC-ENG-CHEM-C-11, “Process Control Plans” To send waste to LERF/ETF, the Evaporator and the Effluent Treatment Facility Operations (ETFO) organizations conduct a waste acceptance process including the submittal to ETFO of a certified waste stream profile sheet for evaluation against the LERF/ETF waste acceptance criteria before each campaign. Process knowledge is used to determine if the waste is acceptable for receipt at LERF/ETF prior to the start of each campaign. ETFO will then transmit a letter to the Evaporator on the Waste Acceptance Approval.	WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Operating Unit Group 3	Environmental	Not modeled.	
	Interface 26 – Wastewater from East Area DSTs to TEDF						
26-1	pH limit between 6.5 and 8.5 Maximum flow = 160 gpm based on 4-hour average (283-E Wastewater treatment Plant)	HNF-SD-W049H-ICD-001, *200 Area Treated Effluent Disposal Facility Interface Control Document*	TO-060-359, *Perform Water Treatment Adjustments for the AY/AZ Tank Ventilation System Evaporator Cooling Towers*	ST 4502, *State Waste Discharge Permit Number ST 4502* ST 4511, *State Waste Discharge Permit Number ST 4511* WHC-SD-W252-ER-001, *Phase II Liquid Effluent Program (Project W-252) Wastewater Engineering Report and BAT/AKART Studies*	Operation	Not modeled.	
26-2	Maximum flow limit for discharge from 702-AZ evaporative cooling water (241-A cooling water) is 600 gpm based on 4-hour average	HNF-SD-W049H-ICD-001, *200 Area Treated Effluent Disposal Facility Interface Control Document*	RPP-15127, *System Design Description for AY/AZ Tank Farm Ventilation Tank Primary System and Associated Cooling Water Systems*, Section 3.4.4.3	ST 4502, *State Waste Discharge Permit Number ST 4502* ST 4511, *State Waste Discharge Permit Number ST 4511* WHC-SD-W252-ER-001, *Phase II Liquid Effluent Program (Project W-252) Wastewater Engineering*	Operation	Not modeled.	Maximum flow rate is total flow rate that can be generated from all 241-A Tank Farm cooling water sources, in which, the majority flow comes from the 702-AZ ventilation system cooling towers. Flow rates (gpm) are based on total annual flow divided by 525,600 min (1

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
				Report and BAT/AKART Studies			year).
26-3	Meet the TEDF generating facilities sampling and analytical requirements as shown in Table 3 and Table 4 of HNF-SD-W049-ICD-001	HNF-SD-W049H-ICD-001, *200 Area Treated Effluent Disposal Facility Interface Control Document*	TO-060-359, *Perform Water Treatment Adjustments for the AY/AZ Tank Ventilation System Evaporator Cooling Towers*	ST 4502, *State Waste Discharge Permit Number ST 4502* ST 4511, *State Waste Discharge Permit Number ST 4511* WHC-SD-W252-ER-001, *Phase II Liquid Effluent Program (Project W-252) Wastewater Engineering Report and BAT/AKART Studies*	Environmental	Not modeled.	
	Interface 27a – Waste feed from East Area DSTs to LAW PS (Near-Tank Option)						
27a-1	Supernatant will be continuously transferred from Tank AP-107 to a near-tank LAW PS process via a dedicated transfer line at a nominal flow rate of 90 gpm.	RPP-RPT-50024, *Treatment Project T4S01 Conceptual Design Report*	Interface not yet operational.	TFC-ENG-STD-26, "Waste Transfer, Dilution and Flushing Requirements"	Technical (calculation)	Flow rate is specified by user.	Additional IFPs for LAW PS will be listed as they are developed.
27a-2	A flush equivalent to 1.5 times the line volume is required after each transfer.	RPP-RPT-50024, *Treatment Project T4S01 Conceptual Design Report*, page 4-67	Interface not yet operational.	TFC-ENG-STD-26, "Waste Transfer, Dilution and Flushing Requirements"	Technical (assumption)	Not modeled.	
	Interface 27b – High solids content from LAW PS return to East Area DSTs (Near-Tank Option)						
27b-1	Separated solids will be continuously returned to Tank AP-107 as a slurry via a dedicated transfer line at a nominal rate of about 78 gpm.	RPP-RPT-50024, *Treatment Project T4S01 Conceptual Design Report*	Interface not yet operational.	RPP-RPT-50024, *Treatment Project T4S01 Conceptual Design Report*	Technical (calculation)	Split of liquids going forward and solids returned is specified by user.	This interface is essentially a higher solids version of the stream from tank farm tanks and represents simply returning slurry to the tank that originated in the tank.
27b-2	Separated cesium will be returned to the tank farm. Its composition will be consistent with a nitric acid ion exchange eluant solution neutralized and chemically adjusted with sodium hydroxide and sodium nitrite compliant with the Tank Farms Waste Compatibility Program requirements for corrosion control.	RPP-RPT-50024, *Treatment Project T4S01 Conceptual Design Report*	Interface not yet operational.	RPP-RPT-50024, *Treatment Project T4S01 Conceptual Design Report*	Technical (calculation)	Waste stream is adjusted to meet Waste Compatibility Program requirements for corrosion control.	The flow rate of the separated cesium solution is not determined but is expected to be a batch transfer compliant with TFC-ENG-STD-26, "Waste Transfer, Dilution, and Flushing Requirements.".

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
27b-3	A flush equivalent to 1.5 times the line volume is required after each transfer.	RPP-RPT-50024, *Treatment Project T4S01 Conceptual Design Report*, page 4-67	Interface not yet operational.	TFC-ENG-STD-26, "Waste Transfer, Dilution, and Flushing Requirements"	Technical (assumption)	Not modeled in HTWOS version 7.7, but incorporated into version 7.8.	Flushing guidance is quite flexible to minimize added volume to preserve DST space
27b-4	Waste return back to DST from LAW PS must meet the Tank Farms Waste Transfer Compatibility Program.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	Interface not yet operational.	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	Technical	Sodium hydroxide is added as needed but sodium nitrite is not.	
	Interface 28 – LAW from LAW PS to WTP LAW Facility						
28-1	DFLAW feed temperature ≤ 140 °F	Memo CCN 268879, "2014 Direct Feed LAW Draft Waste Acceptance Criteria for Conceptual Design Planning Purposes"	Interface not yet operational.	24590-WTP-M4C-V11T-00011, *Revised Calculation of Hydrogen Generation Rates and Times to Lower Flammability Limit for WTP*	Technical (assumption) / Safety	Temperature is assumed to be within acceptable limits; not modeled.	
28-2	DFLAW feed bulk density ≤ 1.47 kg/L	Memo CCN 268879, "2014 Direct Feed LAW Draft Waste Acceptance Criteria for Conceptual Design Planning Purposes"	Interface not yet operational.	24590-LAW-MVC-LCP-00002, *LAW Concentrate Receipt Process System (LCP) Data*	Technical (assumed or measured)	Not controlled by model.	
28-3	DFLAW feed sodium concentration ≤ 10 M	Memo CCN 268879, "2014 Direct Feed LAW Draft Waste Acceptance Criteria for Conceptual Design Planning Purposes"	Interface not yet operational.	Letter CCN 171660, "Direction to Prepare the Conceptual Design Study and Report to Support Early Commissioning of the Low-Activity Waste (LAW) Vitrification Facility"	Technical (assumed)	Sodium concentration is recorded by not enforced. It is compared to the limit using SVF-2899, *SVF-2899_RO_DF_LAW_Feed_Screening.xlsm*.	WTP Contract No. DE-AC27-01RV14136, Specification 7, states, "All LAW feed (soluble and insoluble components) will meet the Tank Farm Operations specifications given in OSD-T-151-00007 (except for free hydroxide), the Tank Waste Remediation System Final Safety Analysis Report, and Technical Safety Requirements, as applicable."
28-4	DFLAW feed pH is between 11 and 14.5	Memo CCN 268879, "2014 Direct Feed LAW Draft Waste Acceptance Criteria for Conceptual Design Planning Purposes"	Interface not yet operational.	24590-WTP-3YD-50-00002, *WTP Integrated Processing Strategy Description*	Technical (calculated)	Not controlled by model.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
28-5	DFLAW feed viscosity ≤ 15 cP	Memo CCN 268879, "2014 Direct Feed LAW Draft Waste Acceptance Criteria for Conceptual Design Planning Purposes"	Interface not yet operational.	24590-LAW-MVC-LCP-00002, *LAW Concentrate Receipt Process System (LCP) Data*	Technical (measured)	Not modeled.	
28-6	DFLAW feed solids concentration ≤ 3.8 wt.%	Memo CCN 268879, "2014 Direct Feed LAW Draft Waste Acceptance Criteria for Conceptual Design Planning Purposes"	Interface not yet operational.	None identified.	Technical (assumed)	Solids concentration is recorded by not enforced. It is compared to the limit using SVF-2899, *SVF-2899_RO_DF_LAW_Feed_Screening.xlsm*.	This value is provided in the WTP Contract DE-AC27-01RV14136, Specification 7, but no technical basis is provided. This waste stream should be solids free unless post-IX precipitation is occurring due to stream being allowed to cool after IX.
28-7	DFLAW slurry critical velocity ≤ 4.75 ft./s in 2", schedule 80 pipe	Letter CCN 248324, "Preliminary Investigation of Waste Acceptance Criteria and Process Requirements Related to Direct LAW Feed"	Interface not yet operational.	24590-LAW-MPC-LCP-00001, *Concentrate Receipt Pump LCP-PMP-00001 A/B & LCP-PMP-00002 A/B*	Technical (calculated)	Not modeled.	Critical velocity calculated by the A.D. Thomas correlation using a solids concentration of 3.8 wt%, 2.5 g/cc particle density, liquid density of 1.44 g/mL (derived from the bulk density limit of 1.46 g/mL) with 30% margin. From 24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*, critical velocity is not a WAC for LAW feed to WTP-PTF.
28-8	Separable organics – no visible immiscible layer.	Letter CCN 248324, "Preliminary Investigation of Waste Acceptance Criteria and Process Requirements Related to Direct LAW Feed"	Interface not yet operational.	RPP-RPT-55646, *One System Evaluation of Separable Organics in the Tank Waste*	Technical (assumed)	Not modeled.	
28-9	Total organic carbon < 10 wt.% or maximum ratio to sodium is 0.5 (mole/mole) for Envelope A/B	Memo CCN 268879, "2014 Direct Feed LAW Draft Waste Acceptance Criteria for Conceptual Design Planning Purposes"	Interface not yet operational.	WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 10, "Waste Treatment and Immobilization Plant," Section 3.4.1. Section 3.4.1 (WAC), total organic carbon	Environmental	Analyte is tracked but not confirmed during modeling.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
				'has been chosen for analysis of the waste feed to ensure that the WTP is not required to comply with Subpart BB found in WAC 173-303-691.'			
28-10	Polychlorinated Biphenyls (PCBs) < 50 ppm	Letter CCN 248324, "Preliminary Investigation of Waste Acceptance Criteria and Process Requirements Related to Direct LAW Feed"	Interface not yet operational.	WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 10, "Waste Treatment and Immobilization Plant," Section 3.4.1.	Environmental	Analyte is tracked but not confirmed during modeling.	
28-11	Pu to metals loading ratio < 6.20 g/kg	Letter CCN 248324, "Preliminary Investigation of Waste Acceptance Criteria and Process Requirements Related to Direct LAW Feed"	Interface not yet operational.	24590-WTP-CSER-ENS-08-0001, *Preliminary Criticality Safety Evaluation Report for the WTP*	Safety	Analyte is tracked but not confirmed during modeling.	This criticality safety limit is a CSER and an ICD-19 WAC limit that is assumed applicable for direct LAW feed to WTP-LAW.
28-12	$U_{fissile}$ to U_{total} ratio < 8.4 g/kg	Letter CCN 248324, "Preliminary Investigation of Waste Acceptance Criteria and Process Requirements Related to Direct LAW Feed"	Interface not yet operational.	24590-WTP-CSER-ENS-08-0001, *Preliminary Criticality Safety Evaluation Report for the WTP*	Safety	Analyte is tracked but not confirmed during modeling.	This criticality safety limit is a CSER and an ICD-19 WAC limit that is assumed applicable for direct LAW feed to WTP-LAW.
28-13	Pu liquid concentration < 0.013 g/L	Letter CCN 248324, "Preliminary Investigation of Waste Acceptance Criteria and Process Requirements Related to Direct LAW Feed"	Interface not yet operational.	24590-WTP-CSER-ENS-08-0001, *Preliminary Criticality Safety Evaluation Report for the WTP*	Safety	Analyte is tracked but not confirmed during modeling.	This criticality safety limit is a CSER and an ICD-19 WAC limit that is assumed applicable for direct LAW feed to WTP-LAW.
28-14	Non-rad constituent concentrations	Letter CCN 248324, "Preliminary Investigation of Waste Acceptance Criteria and Process Requirements Related to Direct LAW Feed"	Interface not yet operational.	Waste Treatment and Immobilization Plant (WTP) Contract, Contract no. DE-AC27-01RV14136, Specification 7	Technical	Analytes are tracked.	The concentrations of such constituents need to be at least analyzed and reported if not then evaluated against applicable WAC.
28-15	Hydrogen generation rate ≤ 8.3E-07 gmole H_2/L/hr at 140 °F	Letter CCN 248324, "Preliminary Investigation of Waste Acceptance Criteria and Process Requirements Related to Direct LAW Feed"	Interface not yet operational.	24590-WTP-M4C-V11T-00011, *Revised Calculation of Hydrogen Generation Rates and Times to Lower Flammability Limit for WTP*	Safety	Not directly modeled but could be calculated using parameters already in the model.	As noted in CCN 24834, this HGR may not be a waste acceptance criterion, but rather a target value to keep under.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
28-16	Liquid fraction unit dose <1003 Sv/L	Memo CCN 268879, "2014 Direct Feed LAW Draft Waste Acceptance Criteria for Conceptual Design Planning Purposes"	Interface not yet operational.		Safety	Dose is not modeled, but is calculated from the radionuclides and analyzed..	
28-17	Total gamma < 1.75E-02 Ci/L	Letter CCN 248324, "Preliminary Investigation of Waste Acceptance Criteria and Process Requirements Related to Direct LAW Feed"	Interface not yet operational.	Calculated value.	Safety	Analytes are tracked but not confirmed during modeling.	Calculated using cesium-137, europium-154 and cobalt-60 concentrations and their respective relative gamma dose factors. The relative gamma dose factors are provided in Table 7-2 of 24590-WTP-Z0C-W13T-00012, *Dose Rate Equivalent for Cs-137, Co-60 and Eu-154 and Specific Activities for Various Radionuclides*. These multipliers are based on the 48-inch concrete case from 24590-WTP-Z0C-W13T-00012 and can be considered conservative. Additionally, the Cs-137 concentration in the feed is limited such that the concentration in the immobilized LAW must be < 0.3 Ci/m^3. However, the total gamma concentration is more limiting.
28-18	Nominal transfer flow rate from LAW PS to WTP LAW Facility is 88 gpm.	Memo CCN 268879, "2014 Direct Feed LAW Draft Waste Acceptance Criteria for Conceptual Design Planning Purposes"	Interface not yet operational.	24590-PTF-M6C-TCP-00001, *Pump and Line Sizing Calculation for TCP Process*	Technical (calculated)	Parameter specified by user.	Based on Near-Tank treatment option report in RPP-RPT-50024, *Treatment Project T4S01 Conceptual Design Report*, Section 4.4.1.1.
28-19	Batch transfer size of 9,115 gallons	Memo CCN 268879, "2014 Direct Feed LAW Draft Waste Acceptance Criteria for Conceptual Design Planning Purposes"	Interface not yet operational.	24590-LAW-MVC-LCP-00002, *LAW Concentrate Receipt Process System (LCP) Data*	Technical (calculated)	Modeled. The LAW melter feed prep (LCP) vessel is topped off when it reaches its lower limit. It has a heel volume of 3740 gal and an operating volume of 12855 gal, so the batch size is 9,115 gal	Batch volume to be controlled with Coriolis type flow meter to measure flow, total flow and density. Batch volume to be controlled with Coriolis type flow meter to measure flow, total flow and

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
						on average.	density. Batch volume to be followed by one line volume of flush water. The amount of flush entering the vessel is expected to be controlled by sensing the change in density between the process fluid and the water.
28-20	Batch transfer cycle is 16 hours	Memo CCN 268879," 2014 Direct Feed LAW Draft Waste Acceptance Criteria for Conceptual Design Planning Purposes"	Interface not yet operational	24590-LAW-3YD-LCP-00001, *System Description for LAW Concentrate Receipt Process (LCP)*	Technical	Not modeled. Batches are transferred on demand (i.e., when the LCP vessel reaches its lower setpoint).	
	Interface 29 – Secondary liquid waste from WTP LAW Facility return to East Area DSTs (DFLAW only)						
29-1	Condensates from the LAW melter off-gas system must satisfy the requirements delineated in HNF-SD-WM-OCD-015.	Letter CCN 248324, "Preliminary Investigation of Waste Acceptance Criteria and Process Requirements Related to Direct LAW Feed"	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* WTP Contract No. DE-AC27-01RV14136, *Design, Construction, and Commissioning of the Hanford Tank Waste Treatment and Immobilization Plant*, Specification 9	Safety	Projected effluent compositions are evaluated and standard corrosion chemicals are added when needed to maintain DST corrosion specification controls.	CCN 248324 actually quotes the WTP Contract, Contract No. DE-AC27-01RV14136, Specification 9, which is strictly only for return of feed material. Therefore, the WTP Contract will require modification to expand the scope of Specification 9 to include LAW melter off-gas system condensate.
	Interface 30a – Waste feed from East Area DSTs to Tank Waste Characterization and Staging						
30a-1	Every waste transfer from DSTs to TWCS will include a 2,100-gallon flush of inhibited water to the downstream TWCS tank.	MMR-13-013, *Tank Waste Characterization and Staging Facility (TWCSF) Pre Scenario Model Development*		TFC-ENG-STD-26, "Waste Transfer, Dilution, and Flushing Requirements"	Operation	Modeled.	
30a-2	Transfers to the new TWCS tanks from DST should allow a 5-day delay for transfer system set-up (consistent with DST-to DST transfer logic)	MMR-13-013, *Tank Waste Characterization and Staging Facility (TWCSF) Pre Scenario Model Development*			Operation	Modeled	
30a-3	Only one transfer into the TWCS from the 200 East DST at a time is allowed	MMR-13-013, *Tank Waste Characterization and Staging Facility (TWCSF) Pre Scenario Model Development*			Operation	Modeled	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
30a-4	Nominal pump rate is 140 gpm	MMR-13-013, *Tank Waste Characterization and Staging Facility (TWCSF) Pre Scenario Model Development*	Interface not yet operational.		Operation	Modeled.	
30a-5	190-day sample and analysis period	MMR-13-013, *Tank Waste Characterization and Staging Facility (TWCSF) Pre Scenario Model Development*	Interface not yet operational.		Operation	Modeled.	
30a-6	5 volume percent of all slurries feed to TWCS-6 tank	MMR-14-024, *TWDIF Flowsheet Modeling*	Interface not yet operational.		Operation	Modeled.	
30a-7	Target solids in stream to TWCS is 15 wt%	MMR-14-024, *TWDIF Flowsheet Modeling*	Interface not yet operational.		Operation	Modeled.	
30a-8	Once the transfer into a TWCS tank is completed, a minimum of 190 days hold time will be applied for mixing, sampling, and analysis prior to transferring out (10 days to complete the sample and 180 days for analysis)	MMR-13-013, *Tank Waste Characterization and Staging Facility (TWCSF) Pre Scenario Model Development*	Interface not yet operational.		Operation	Modeled.	
	Interface 30b – Off spec waste from Tank Waste Characterization and Staging returns to East Area DSTs						
30b-1	Similar IFPs as shown for interfaces 32 and 33b..	N/A	N/A	N/A	Operation	N/A	
	Interface 31 – Direct Feed HLW from Tank Waste Characterization and Staging to WTP HLW Facility						
31-1	Slurry in TWCS targeted to be at least 15 wt% solids prior to transfer to WTP HLW facility.	MMR-13-013, *Tank Waste Characterization and Staging Facility (TWCSF) Pre Scenario Model Development* MMR-13-024, *DF-HLW Business Case C: TWCSF with DF HLW*	Interface not yet operational.		Operation	Modeled.	
31-2	Only one transfer out of TWCS to HLW at a time is allowed.	MMR-13-013, *Tank Waste Characterization and Staging Facility (TWCSF) Pre Scenario Model Development*	Interface not yet operational.		Operation	Modeled.	
31-3	Inhibited water flush volume from TWCS to WTP HLW facility assumed to be a total flush of 2,500 gallons to NT-3 (new tank)	MMR-13-024, *DF-HLW Business Case C: TWCSF with DF HLW*	Interface not yet operational.	TFC-ENG-STD-26, *Waste Transfer, Dilution, and Flushing Requirements*	Operation	Modeled.	
	Interface 32 – Secondary Liquid Effluent return from HLW to East Area DSTs (DFHLW only)						
32-1	Condensates from the HLW melter off-gas system must satisfy the requirements delineated in HNF-SD-WM-OCD-015. Implementing the DST corrosion spec., check and add chemicals as needed so that effluent returning to DSTs meets the corrosion specifications.	MMR-13-024, *DF-HLW Business Case C: TWCSF with DF HLW*	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program* WTP Contract No. DE-AC27-01RV14136, *Design,*	Safety	The melter offgas condensates are collected in a WTP vessel and the corrosion specification is applied (NaOH, NaNO2 are added as needed),	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
				Construction, and Commissioning of the Hanford Tank Waste Treatment and Immobilization Plant, Specification 9		prior to transferring back to tank farms.	
31-2	For each transfer completed from NT-3 (new tank) to a DST, simulate post-transfer line flush by adding 2,800 gallons inhibited water to the destination DST.	MMR-13-024, *DF-HLW Business Case C: TWCSF with DF HLW*	Interface not yet operational	TFC-ENG-STD-26, *Waste Transfer, Dilution, and Flushing Requirements*	Operation	Modeled.	
	Interface 33a – Waste Feed from East Area DSTs to WTP Pretreatment Facility						
33a-1	LAW will be transferred from Tank Farms to WTP in batches up to 1 Mgal (excluding transfer line flush).	RPP-17152, *Hanford Tank Waste Operations Simulator (HTWOS) Version 7.7 Model Design Document*	Interface not yet implemented.	24590-PTF-M5-V17T-00003, *Process Flow Diagram Waste Feed Receipt System FRP*, states that each LAW receipt tank has a working volume of 375,000 gal (giving 1.5 Mgal total for 4 tanks) when only two PJMs are operating. When all 12 PJMs are operating, 24590-PTF-MTE-FRP-00004, *Clarification to PJMs Mixing at Upper Operating Level and Account for Flush in Overflow Sizing*, gives the working volume of each vessel as approximately 363,700 gal (giving 1,091,100 gal total for 4 tanks).	Technical (assumed)	Four LAW waste receipt tanks of the WTP system are simulated as a single tank.	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*, specifies a requirement for WTP-PTF to have capability to receive without interruption1.125 Mgal of LAW feed while processing from the remaining capacity of 0.375 Mgal of LAW feed.
33a-2	Following the transfers of feed to the WTP Contractor's feed receipt system, the TOC will begin flushing the transfer pipeline with a volume of water that, combined with any pre-transfer flush, is not more than three times the transfer pipeline capacity (7,500 gallon total). The water flush velocity shall be between 6 and 10 ft./s, not to exceed the system design pressure.	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		TFC-ENG-STD-26 requires a flush of inhibited water of volume 1.5 times the line volume after a slurry transfer. HNF-4163, *Double-Shell Tank Diluent and Flush Subsystem Specification*, requires the flush at a velocity between 6 and 10 feet/s. The same flush volume and velocity is assumed for LAW transfers in 24590-WTP-ICD-MG-01-019.	Technical (assumed)	The flush is combined with the LAW to provide a total volume of 1Mgal.	
33a-3	LAW feed is staged in the feed DST for 210 days to provide time to complete feed compliance verification sampling (30 days) and sample analysis (samples must be provided to WTP contractor at least 180 days before feed is delivered to the WTP).	RPP-17152, *Hanford Tank Waste Operations Simulator (HTWOS) Version 7.7 Model Design Document*		24590-WTP-RPT-MGT-11-014, *Initial Data Quality Objectives for WTP Feed Acceptance Criteria*	Technical/Environmental (assumed)	Modeled.	The 30-day sampling time is assumed based on operating experience.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
33a-4	LAW feed solids concentration is ≤ 3.8 wt.%	*ICD 19 –*		WTP Contract No. DE-AC27-01RV14136, *Design, Construction, and Commissioning of the Hanford Tank Waste Treatment and Immobilization Plant*, Specification 7	Technical (assumed)	Tacked for each feed batch but not enforced. It is compared to the limit in SVF-2455, *SVF-2455_R1_WTP_PT_WAC_Feed_Screening.xlsm*.	
33a-5	LAW feed slurry viscosity is ≤ 21 cP	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		24590-PTF-ES-ENG-09-001, *Pretreatment FRP-VSL-00002A/B/C/D Vessel Mixing Assessment* 24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*	Technical (calculated)	Not modeled.	
33a-6	LAW feed slurry bulk density is < 1.46 kg/L	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		RPP-5346, *Waste Feed Delivery Transfer System Analysis*	Technical (measured)	The LAW feed density of 1.46 kg/L in Table 7 of 24590-WTP-ICD-MG-01-019 is noted to be a legacy value originating from RPP-5346. RPP-5346 provides this value as a 90 percentile bounding LAW density based on actual measurements. There is a possibility that actual LAW densities encountered during operation will exceed 1.46 kg/L, which would lead to the feed batch requiring dilution. There is an opportunity to avoid the dilution if margin can be applied to the density WAC.	Values are legacy values which originated fromRPP-5346, *Waste Feed Delivery Transfer System Analysis* have been integrated into the WTP Project design, and are now considered WTP waste acceptance criteria.
33a-7	LAW feed hydrogen generation rate is ≤ 3.7E-07 gmole H_2/L/hour at reference temperature of 120 °F	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		24590-WTP-M4C-V11T-00011, *Revised Calculation of Hydrogen Generation Rates and Times to Lower Flammability Limit for WTP*	Nuclear safety	Tracked.	
33a-8	LAW feed receipt temperature is < 120 °F	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*	Technical (assumed)	The batches are assumed to meet the temperature limits.	
33a-9	Ammonia concentration is < 0.04M	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control*		Letter CCN 119662, "Contract No. DE-AC27-01RV14136 –	Nuclear safety (measured/assu	Not currently	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
		Document for Waste Feed		Closure Information for Two Conditions of Acceptance for the Hanford Tank Waste Treatment and Immobilization Plant Preliminary Safety Analysis Report"	med)	tracked/modeled.	
33a-10	Separable organics – no visible immiscible layer	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		RPP-RPT-55646, *One System Evaluation of Separable Organics in the Tank Waste* 24590-WTP-RPT-PE-12-004, *Proposed Deminimus Organic Concentration in Received Tank Waste*	Technical (assumed)	Not modeled.	The WTP Contractor has proposed a deminimus concentration level for separable organics that could be sent to the WTP without adversely affecting the WTP.
33a-11	Total organic carbon is < 10 wt.%	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 10, "Waste Treatment and Immobilization Plant," Section 3.4.1. Section 3.4.1 (WAC), total organic carbon 'has been chosen for analysis of the waste feed to ensure that the WTP is not required to comply with Subpart BB found in WAC 173-303-691.'	Environmental	Analyte is tracked but not confirmed during modeling.	
33a-12	Concentration of PCBs is < 50 ppm	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 10, "Waste Treatment and Immobilization Plant," Section 3.4.1.	Environmental	Analyte is tracked but not confirmed during modeling.	
33a-13	Slurry pH ≥ 12	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		The minimum pH is not inconsistent with the minimum hydroxide concentration of 0.01M required for DST corrosion mitigation required in OSD-T-151-00007.	Technical (measured)	Tracked for each feed batch but not enforced. It is compared to the limit in SVF-2455, *SVF-2455_R1_WTP_PT_WAC_Feed_Screening.xlsm*.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
33a-14	Waste feed compatibility, temperature rise < ± 20 °C	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion,* Part III, Operating Unit Group 10, “Waste Treatment and Immobilization Plant.”	Environmental	Not modeled.	Per ASTM Method D5058-90 using 10 mL samples. ASTM D5058 provides standard test practices to screen wastes from potentially hazardous reactions. If, after mixing samples, no reactions are observed and no temperature change outside the specified range is observed, then the waste passes the compatibility test.
33a-15	Liquid fraction unit liter dose < 1500 Sv/L at 10M Na	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		Letter CCN 201898 / HNF-40122, “WTP Material at Risk: Evaluation of Important Uncertainties and Resulting WTP Design Conservatisms”	Nuclear Safety	Tracked.	
33a-16	Pu to metals loading ratio < 6.20 g/kg	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		24590-WTP-CSER-ENS-08-0001, *Preliminary Criticality Safety Evaluation Report for the WTP*	Nuclear Safety	Tracked.	As described in 24590-WTP-ICD-MG-01-019, 24590-WTP-CSER-ENS-08-0001 is under review and this IFP may change.
33a-17	U fissile to U total ratio < 8.4 g/kg	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		24590-WTP-CSER-ENS-08-0001, *Preliminary Criticality Safety Evaluation Report for the WTP*	Nuclear Safety	Tracked.	As described in 24590-WTP-ICD-MG-01-019, 24590-WTP-CSER-ENS-08-0001 is under review and this IFP may change.
33a-18	Pu concentration of liquids < 0.013 g/L	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		24590-WTP-CSER-ENS-08-0001, *Preliminary Criticality Safety Evaluation Report for the WTP*	Nuclear Safety	Tracked.	As described in 24590-WTP--5-MG-01-019, 24590-WTP-CSER-ENS-08-0001 is under review and this IFP may change.
33a-19	Sodium molarity ≤ 10 M	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		OSD-T-151-00007, *Operating Specifications for the Double-Shell Storage Tanks* WTP Contract No. DE-AC27-01RV14136, *Design, Construction, and Commissioning of the Hanford Tank Waste Treatment and Immobilization Plant*, Specification 7	Technical (assumed)/ Nuclear safety	Tracked.	WTP Contract No. DE-AC27-01RV14136, Specification 7, states, “All LAW feed (soluble and insoluble components) will meet the Tank Farm Operations specifications given in OSD-T-151-00007 (except for free hydroxide), the Tank Waste Remediation System Final Safety Analysis

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
							Report, and Technical Safety Requirements, as applicable."
33a-20	DE-AC27-01RV14136, Specification 7 parameters	WTP Contract No. DE-AC27-01RV14136, *Design, Construction, and Commissioning of the Hanford Tank Waste Treatment and Immobilization Plant*, Specification 7			Technical (assumed)	Tracked.	
33a-21	Waste feed will be transferred at a minimum velocity of 6 ft./s, equivalent to a volumetric flowrate of 140 gpm in a nominal 3-inch, Schedule 40 waste transfer pipe.	24590-WTP-ICD-MG-01-019 *ICD 19 – Interface Control Document for Waste Feed*		RPP-5346, *Waste Feed Delivery Transfer System Analysis*	Technical	The DST to WTP transfers are modeled at 140 gpm	
33a-22	Waste feed transfer system design pressure limit to 400 psig.	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		HNF-4161, *Double-Shell Tank Transfer Piping Subsystem Specifications* HNF-4160, *Double Shell Tank Transfer Valving Subsystem Specification* RPP-5346, *Waste Feed Delivery Transfer System Analysis*	Safety	Pressures not modeled. It is assumed that the 140 gpm flow rate will maintain the pressure within limits.	
33a-23	Waste feed transfer system design temperature limit to 200 °F	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		24590-WTP-3PB-P000-TW62F, *River Protection Project – Waste Treatment Plant – Engineering Specification for Piping Class W62F* W-211-TP-P1, *Procurement Specification: Double Containment Piping TFC/WTP Waste Transfer Piping*	Operational	Not modeled, The waste is transferred at a constant temperature of 25 °C.	
33a-24	HLW solid concentration is ≤ 200 g/L	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		CCN 220459, "Technology Steering Group-Issue Closure Record – Partial Closure EFRT Issue M-3 (Closure Criteria 4, Recommended Contract Changes), Inadequate Mixing	Operational	The model targets 10 wt% solids. Some batches may exceed this.	Actual specification is 10 to 200 g/L. Except AZ-101 and AZ-102 where the minimum does not apply.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
				System Design”			
33a-25	HLW slurry rheology (at 25^{o}C) with consistency < 10 cP and yield stress < 1.0 Pa	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		Memo CCN 074567, “Rheology of "As-Received" HLW Feed” RPP-RPT-51652, *One System Evaluation of Waste Transferred to the Waste Treatment Plant*	Operational	Not modeled.	
33a-26	HLW slurry bulk density is < 1.5 kg/L	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		RPP-5346, *Waste Feed Delivery Transfer System Analysis*	Technical	Density is tracked but not controlled. It is assumed that targeting 10 wt% solids will keep the density within the limit.	
33a-27	HLW hydrogen generation rate is ≤ 2.1E-06 gmole H2/L/Hr @150F	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		24590-WTP-M4C-V11T-00011, *Revised Calculation of Hydrogen Generation Rates and Times to Lower Flammability Limit for WTP*	Safety	Tracked.	
33a-28	HLW waste feed temperature < 150F	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		24590-PTF-M4C-V11T-00015, *Evaluation of 150 °F HLW Feed Temperature Limit*	Operational	Tracked.	24590-PTF-M4C-V11T-00015, *Evaluation of 150 °F HLW Feed Temperature Limit*
	Interface 33b – Off spec waste return from WTP Pretreatment Facility to East Area DSTs						
33b-1	The TOC will maintain sufficient space to receive back HLW or LAW feed batches for at least 4 days after delivery of the batch to allow sufficient time for WTP to determine if a delivered batch is WAC-compliant	24590-WTP-ICD-MG-01-019, *Interface Control Document for Waste Feed*		No technical basis. The requirement is for the mission planning purposes	Technical	Not modeled.	
33b-2	Waste return back to Tank Farms must meet transfer requirements defined in the Specification 9, Liquids or Slurries Transferred to DOE Tanks by Pipeline and the Tank Farms Waste Transfer Compatibility Program.	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	Technical (measured)/safety	No off-specification waste returns are modeled.	
33b-3	As quickly as possible following waste feed returns to the Tank Farms, the TOC will begin flushing the transfer pipeline with a volume of water that, combined with any pre-transfer flush, is not more than three times the transfer pipeline capacity (7500 gallons total). The flush water velocity shall be between 6 and 10 ft./s, not to exceed the system design pressure.	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		TFC-ENG-STD-26 requires a flush of inhibited water of volume 1.5 times the line volume after a slurry transfer. HNF-4163, *Double-Shell Tank Diluent and Flush Subsystem Specification*, requires the flush at a velocity between 6 and 10 feet/s.	Technical (assumed)	No off-specification waste returns are modeled.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
	Interface 34a – Waste feed from Tank Waste Characterization and Staging to WTP Pretreatment Facility						
34a-1	HLW will be transferred from Tank Farms to the HLW feed receipt vessel in batches up to 145 kgal (excluding transfer line flush).	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		24590-PTF-M6C-HLP-00006, *Vessel Sizing Calculation for HLW Feed Receipt Vessel (HLP-VSL-00022)*	Technical (calculated)	The HLW batch size of the transfers to WTP will be targeted at 140,500 gallons.	
34a-2	Following the transfers of feed to the WTP Contractor's feed receipt system, the TOC will begin flushing the transfer pipeline with a volume of water that, combined with any pre-transfer flush, is not more than three times the transfer pipeline capacity (7500 gallon total). The water flush velocity shall be between 6 and 10 ft./s, not to exceed the system design pressure.	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		TFC-ENG-STD-26 requires a flush of inhibited water of volume 1.5 times the line volume after a slurry transfer. HNF-4163, *Double-Shell Tank Diluent and Flush Subsystem Specification*, requires the flush at a velocity between 6 and 10 feet/s.	Technical (assumed)	After each transfer to WTP, a 2,500-gallon flush of inhibited water will occur in two parts; 1,500 gallons will be routed to HLP-VSL-00022 and 1000 gallons will be routed to PWD-VSL-00043.	
34a-3	Waste feed will be transferred at a minimum velocity of 6 feet/s, equivalent to a volumetric flow rate of 140 gpm in a nominal 3-inch, Schedule 40 waste transfer pipe.	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		TFC-ENG-STD-26 requires the transfer velocity to be at least 6 feet/s for slurries containing solids at a concentration >5 wt.% or unless a lower velocity can be justified on the basis of a critical velocity calculation.	Technical (measured)	Modeled.	A technical basis category of 'measured' is assigned given the value is based on tank farms operations experience.
34a-4	Solids concentration <200 g/L.	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		None identified.	Technical (assumed)	HLW transfers target solids concentration less than 10 wt.%.	
34a-5	HLW slurry rheology (at 25^{o}C) with consistency < 10 cP and yield stress < 1.0 Pa	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		Memo CCN 074567, “Rheology of ‘As-Received’ HLW Feed”	Technical (measured)	Not directly modeled but implied in target solids concentration less than 10 wt.%.	
34a-6	HLW slurry bulk density is < 1.5 kg/L	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		None identified.	Technical (assumed)	Tracked.	
34a-7	HLW transfer critical velocity is ≤ 4 ft./s	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		RPP-5346, *Waste Feed Delivery Transfer System Analysis*	Technical (calculated)	Not modeled/tracked.	
34a-8	HLW maximum particle size is < 310 µm	24590-WTP-ICF-ENG-13-0001, *Incorporate Waste Acceptance Criteria Technical Team Recommendations into ICD-19*		RPP-9805, *Values of Particle Size, Particle Density, and Slurry Viscosity to Use in Waste Feed Delivery Transfer System Analysis*	Technical (measured)	Not modeled/tracked.	Tank waste contains solids with particle size larger than 310 µm that will require size reduction prior to transfer to WTP.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
34a-9	Hydrogen generation rate is ≤ 2.1E-06 gmole H_2/L/hour at reference temperature of 150F	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		24590-WTP-M4C-V11T-00011, *Revised Calculation of Hydrogen Generation Rates and Times to Lower Flammability Limit for WTP*	Safety	Tracked.	The supporting calculation is based on expected bounding process compositions and not the limiting compositions delineated in DE-AC27-01RV14136, Specification 8.
34a-10	HLW waste feed temperature < 150 ^{o}F	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		24590-PTF-M4C-V11T-00015, *Evaluation of 150 °F HLW Feed Temperature Limit*	Technical (measured)	Temperature is assumed to be compliant.	
34a-11	Ammonia concentration is < 0.04M	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		Letter CCN 119662, "Contract No. DE-AC27-01RV14136 – Closure Information for Two Conditions of Acceptance for the Hanford Tank Waste Treatment and Immobilization Plant Preliminary Safety Analysis Report"	Nuclear safety (measured/assumed)	Tracked.	
34a-12	No visible separable organics	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		RPP-RPT-55646, *One System Evaluation of Separable Organics in the Tank Waste*	Technical (assumed)	Not modeled.	The WTP Contractor has proposed a deminimus concentration level for separable organics that could be sent to the WTP without adversely affecting the WTP.
34a-13	Total organic carbon is < 10 wt.%	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 10, "Waste Treatment and Immobilization Plant," Section 3.4.1. Section 3.4.1 (WAC), total organic carbon has been chosen for analysis of the waste feed to ensure that the WTP is not required to comply with Subpart BB found in WAC 173-303-691.'	Environmental	Analyte is tracked but not confirmed during modeling.	
34a-14	Concentration of PCBs is < 50 ppm	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 10, "Waste Treatment	Environmental	Analyte is tracked but not confirmed during modeling.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
				and Immobilization Plant," Section 3.4.1.			
34a-15	Slurry pH ≥ 12	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		The minimum pH is not inconsistent with the minimum hydroxide concentration of 0.01M required for DST corrosion mitigation required in OSD-T-151-00007.	Technical (measured)	Tracked for each feed batch but not enforced. It is compared to the limit in SVF-2455, *SVF-2455_R1_WTP_PT_WAC_Feed_Screening.xlsm*.	
34a-16	Waste feed compatibility, temperature rise < ± 20 ^{0} C	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 10, "Waste Treatment and Immobilization Plant,"	Environmental	Not modeled.	Per ASTM Method D5058-90 using 10 mL samples. ASTM D5058 provides standard test practices to screen wastes from potentially hazardous reactions. If, after mixing samples, no reactions are observed and no temperature change outside the specified range is observed, then the waste passes the compatibility test.
34a-17	Liquid fraction unit liter dose < 1500 Sv/L at 10M Na	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		Letter CCN 201898 / HNF-40122, "WTP Material at Risk – Evaluation of Important Uncertainties and Resulting WTP Design Conservatisms"	Safety	Tracked for each feed batch but not enforced. It is compared to the limit in SVF-2455, *SVF-2455_R1_WTP_PT_WAC_Feed_Screening.xlsm*.	
34a-18	Solid fraction unit liter dose < 2.9E+05 Sv/L	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		Letter CCN 201898 / HNF-40122, "WTP Material at Risk: Evaluation of Important Uncertainties and Resulting WTP Design Conservatisms"	Safety	Tracked for each feed batch but not enforced. It is compared to the limit in SVF-2455, *SVF-2455_R1_WTP_PT_WAC_Feed_Screening.xlsm*.	
34a-19	Pu to metals loading ration < 6.20 g/kg	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		24590-WTP-CSER-ENS-08-0001, *Preliminary Criticality Safety Evaluation Report for the WTP*	Safety	Tracked for each feed batch but not enforced. It is compared to the limit in SVF-2455, *SVF-2455_R1_WTP_PT_WAC_Feed_Screening.xlsm*.	As described in 24590-WTP-ICD-MG-01-019, 24590-WTP-CSER-ENS-08-0001 is under review and this IFP may change.
34a-20	U fissile to U total ratio < 8.4 g/kg	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		24590-WTP-CSER-ENS-08-0001, *Preliminary Criticality Safety Evaluation Report for the WTP*	Safety	Tracked for each feed batch but not enforced. It is compared to the limit in SVF-2455, *SVF-*	As described in 24590-WTP-ICD-MG-01-019, 24590-WTP-CSER-ENS-08-0001 is under review

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
						2455_R1_WTP_PT_WAC_Feed_Screening.xlsm.	and this IFP may change.
34a-21	Pu concentration of liquids < 0.013 g/L	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		24590-WTP-CSER-ENS-08-0001, *Preliminary Criticality Safety Evaluation Report for the WTP*	Safety	Tracked for each feed batch but not enforced. It is compared to the limit in SVF-2455, *SVF-2455_R1_WTP_PT_WAC_Feed_Screening.xlsm*.	As described in 24590-WTP-ICD-MG-01-019, 24590-WTP-CSER-ENS-08-0001 is under review and this IFP may change.
34a-22	Sodium molarity ≤ 10 M	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		OSD-T-151-00007, *Operating Specifications for the Double-Shell Storage Tanks*	Technical (assumed)/ Safety	Tracked for each feed batch but not enforced. It is compared to the limit in SVF-2455, *SVF-2455_R1_WTP_PT_WAC_Feed_Screening.xlsm*.	WTP Contract No. DE-AC27-01RV14136 Specification 7 states, "All LAW feed (soluble and insoluble components) will meet the Tank Farm Operations specifications given in OSD-T-151-00007 (except for free hydroxide), the Tank Waste Remediation System Final Safety Analysis Report, and Technical Safety Requirements, as applicable."
34a-23	DE-AC27-01RV14136, Specification 8 parameters	WTP Contract No. DE-AC27-01RV14136, *Design, Construction, and Commissioning of the Hanford Tank Waste Treatment and Immobilization Plant*, Specification 8			Technical (assumed)	Tracked.	
	Interface 34b – Off spec waste return from WTP Pretreatment Facility to Tank Waste Characterization and Staging						
34b-1	Waste return back to Tank Farms must meet transfer requirements defined in the Specification 9, Liquids or Slurries Transferred to DOE Tanks by Pipeline and the Tank Farms Waste Transfer Compatibility Program.	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		HNF-SD-WM-OCD-015, *Tank Farms Waste Transfer Compatibility Program*	Technical (measured)/safety	Not modeled.	
34b-2	As quickly as possible following waste feed returns to the Tank Farms, the TOC will begin flushing the transfer pipeline with a volume of water that, combined with any pre-transfer flush, is not more than three times the transfer pipeline capacity (7,500 gallons total). The flush water velocity shall be between 6 and 10 ft./s, not to exceed the system design pressure.	24590-WTP-ICD-MG-01-019, *ICD 19 – Interface Control Document for Waste Feed*		TFC-ENG-STD-26 requires a flush of inhibited water of volume 1.5 times the line volume after a slurry transfer. HNF-4163, *Double-Shell Tank Diluent and Flush Subsystem Specification*, requires the flush at a velocity between 6	Technical (assumed)	Not modeled.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
				and 10 feet/s.			
	Interface 35a – High Level Waste from WTP PT to WTP HLW						
35a-1	WTP-HLW Waste Acceptance Criteria (TBD)	None	None	None	N/A	No acceptance criteria are modeled or tracked for HLW Vitrification. It is assumed that the WTP PT product meets acceptance criteria.	
35a-2	The radiological inventory of waste entering the HLW facility must be at or below the maximum HLW specifications as described in 24590-PTF-M4C-V11T-00008, *Pretreatment, HLW and LAW Vitrification Predicted Maximum Radionuclides*.			24590-WTP-PSAR-ESH-01-002-04, *Preliminary Documented Safety Analysis to Support Construction Authorization; HLW Facility Specific Information*, Section 3.3.2.1.1	Nuclear Safety/ Environmental	No limits are currently enforced. It is assumed that the WTP PT product meets applicable criteria.	Higher concentrations would be outside the limits evaluated in the preliminary DSA. To ensure that requirements are met, waste is to be sampled and analyzed both before transfer and after receipt.
35a-3	Where a velocity of 6 ft/s is not achievable, the flush fluid velocity (from HLP-VSL-00028 to WTP HLW) will have a margin of 210% above the critical velocity.	CCN 214961, “Technology Steering Group – Issue Closure Record – EFRT Issue M1 – Plugging in Process Piping”		None identified.	Technical	Not modeled.	
35a-4	Limitation on Batch Transfer Volume: There shall be an administrative control or safety engineered control at PT to limit the batch size of a transfer from PT to HLW to a maximum of 7,650 gal (Sections 3.4.1.2.1.6, 3.4.1.3.1.6, PDSA – HLW Facility)	24590-PTF-3YD-HLP-00001, *System Description for the HLW Lag Storage and Feed Blending Process System (HLP)*, Section 4.2.8		24590-HLW-M6C-HFP-00001, *HFP-VSL-00001, 00002, 00005 and 00006 Vessels Sizing Calculation*	Nuclear Safety/ Environmental	Not modeled.	This is the overflow volume of the vessel (24590-WTP-RPT-PT-02-005, *Flowsheet Bases, Assumptions, and Requirements*, Section 4.1.3.2); actual transfer volumes will be smaller. This requirement protects an assumption in the safety analysis.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
35a-5	Batch transfer volume is 4,305 gal.	24590-WTP-RPT-PT-02-005, *Flowsheet Bases, Assumptions, and Requirements* (Section 4.1.3.2) 24590-HLW-M6C-HFP-00001, *HFP-VSL-00001, 00002, 00005, and 00006 Vessels Sizing Calculation*, Section 10.1		24590-HLW-M6C-HFP-00001, *HFP-VSL-00001, 00002, 00005, and 00006 Vessels Sizing Calculation*, Section 10.1	Technical	HTWOS models the heel as 1,355 gal and tops off the vessel with each batch, so the volume of each batch is approximately 4,305 gal.	24590-WTP-RPT-PT-02-005 (BARD) lists 5,660 gal as the batch transfer volume and 5,200 gal as the nominal target volume (to leave room for glass former shimming, if needed). The 5,660 gal batch volume did not account for a 1,355 gal heel that remains in the receiving tank. Therefore, the actual batch volume should be 4,305 gal.
35a-6	Normal batch transfer flow rate for transfers of HLW feed from HLP-VSL-00028 to HFP-VSL-00001/5 is 90 gpm.	24590-PTF-MPC-HLP-00016, *Pump and Line Sizing Calculation for Pumps HLP-PMP-00019A/B*, Sections 7.1 and 8.		24590-PTF-MPC-HLP-00016, *Pump and Line Sizing Calculation for Pumps HLP-PMP-00019A/B*, Sections 7.1 and 8.	Technical	Flow is modeled as 56 gpm.	
35a-7	Transfer Line Flushes: Each transfer from the HLP to the HLW Facility is followed with one line-volume of flush using plant wash fluid (normally DIW or process condensate) to the HLW melter feed prep vessels (HFP-VSL-00001/5) followed by a flush of two line-volumes, which will be returned to the Pretreatment Facility PWD-VSL-00043. The line will be flushed at a velocity of 7 ft/s. The total flush volume is 1,460 to 1,490 gal.	24590-PTF-3YD-HLP-00001, *System Description for the HLW Lag Storage and Feed Blending Process System (HLP)*, Section 7.2.18 24590-HLW-3YD-HFP-00001, *System Description for the HLW Concentrate Receipt Process and HLW Melter Feed Process Systems (HCP & HFP)*, Section 7.2.2 24590-WTP-RPT-PT-02-005, *Flowsheet Bases, Assumptions, and Requirements*, Appendix F		24590-PTF-MPC-HLP-00016, *Pump and Line Sizing Calculation for Pumps HLP-PMP-00019A/B*, Sections 7.39 and 8. 24590-HLW-MVC-HFP-00001, *Process Information for HFP Vessels (HFP-VSL-00001, HFP-VSL-00002, HFP-VSL-00005, and HFP-VSL-00006)*	Technical (calculated)	No line flush modeled for this transfer.	7 ft/s is 30% above the critical flush flow rate of 215 gpm (5.414 ft/s) identified in 24590-PTF-MPC-HLP-00016. Flush volumes from WTP-PTF to WTP-HLW are based on a calculated maximum line length of 1,090 feet and 3 in. Schedule 40 line in 24590-WTP-M6C-M11T-00007. Document 24590-HLW-M4C-30-00003, *HLW Vitrification Facility Feed and Effluent Design Basis Flowsheets*, assumes 1,100 ft to be conservative and also no more than 3 pipe volumes total flush volume within 4 hours of transfer.
35a-8	Process Inputs Basis of Design for HLW slurry from WTP-PTF: slurry density =69.3 to 72.8 lb/ft^3, liquid density = 62.7 to 64.7 lb/ft3, viscosity = 0.8 cP to 30 cP at 30 Pa (non-Newtonian), Na+ molarity = 0.1 to 1.0.	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Not currently tracked or enforced..	The operating margin is not defined.
	Interface 35b – Secondary Liquid Waste from WTP HLW to WTP PT						

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
35b-1	The batch transfer flow rate is 48 gpm for waste transfers from RLD-VSL-00008 and RLD-VSL-00007 to the Pretreatment Facility.	24590-WTP-RPT-PT-02-005, *Flowsheet Bases, Assumptions, and Requirements*, Sections 4.5.3.1.1.2 and 4.5.3.1.3.1			Operations	RLD-VSL-00007 and 00008 are not modeled. The HLW secondary liquid waste is pumped directly to PWD-VSL-00043 from the scrubber at 48 gpm.	
35b-2	Process Inputs Basis of Design acidic waste sent from WTP-HLW to WTP-PTF (from RLD-VSL-00007 to PWD-VSL-00043): slurry density = 65.7 to 65.8 lb/ft^3, liquid density = n/a, viscosity = 0.5 to 0.5 cP, Na+ molarity = 0.0 to 0.1.	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Not currently tracked or enforced.	These are max and min expected values, not the processing limits.
35b-3	Process Inputs Basis of Design for Plant wash and drains sent from HLW Facility to Pretreatment Facility (RLD-VSL-00008 to RLD-VSL-00007 to PWD-VSL-00043) (Stream RLD63 in PIBOD): slurry density = 65.7 to 65.8 lb/ft^3, liquid density = n/a, viscosity = 0.5 to 0.5 cP, Na+ molarity = 0.0 to 0.1.	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Not currently tracked or enforced.	These are max and min expected values, not the processing limits.
35b-4	Process Inputs Basis of Design for plant wash and drains sent from HLW Facility to Pretreatment Facility (RLD-VSL-00008 to PWD-VSL-00033) (Stream RLD64 in PIBOD): slurry density = 65.7 to 65.8 lb/ft^3, liquid density = n/a, viscosity = 0.5 to 0.5 cP, Na+ molarity = 0.0 to 0.1.	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Not currently tracked or enforced.	These are max and min expected values, not the processing limits.
35b-5	Transfer Line Flush: Total flush volume required for transfers from RLD-VSL-00007 at HLW Facility to PWD-VSL-00043 at PT Facility is 119 gal.	24590-WTP-RPT-PT-02-005, *Flowsheet Bases, Assumptions, and Requirements*, Appendix F			Technical	Not modeled.	
	Interface 36 – Offgas from WTP HLW to Stack						
36-1	HCl and Cl_2 Gas Emissions: Hydrochloric acid and chlorine gas emissions from the HLW Vitrification System shall not exceed 21 ppmv, combined.	24590-HLW-3YD-HOP-00001, *System Description for the HLW Melter Offgas Treatment Process and Process Vessel Vent Exhaust (HOP and PVV Systems)*		WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, PartIII.10.J.1.b	Environmental	HCl can be quantified; chlorine is not tracked. No limits are enforced. Emissions are based on application of split factors.	The technical basis for this limit has not been evaluated.
36-2	Particulate Matter Emissions: Particulate matter emissions from the HLW Vitrification System shall not exceed 34 mg/dscm (0.015 grains/dscf).	24590-HLW-3YD-HOP-00001, *System Description for the HLW Melter Offgas Treatment Process and Process Vessel Vent Exhaust (HOP and PVV Systems)*		WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III.10.J.1.b	Environmental	Not currently tracked or modeled.	The technical basis for this limit has not been evaluated.
36-3	Dioxin and Furan TEQ Emissions: Dioxin and furan TEQ emissions from the HLW Vitrification System shall not exceed 0.2 ng/dscm.	24590-HLW-3YD-HOP-00001, *System Description for the HLW Melter Offgas Treatment Process and Process Vessel Vent Exhaust (HOP and PVV Systems)*		WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III.10.J.1.b	Environmental	Not currently tracked or modeled.	The technical basis for this limit has not been evaluated.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
36-4	Mercury Emissions: Mercury emissions from the HLW Vitrification System shall not exceed 45 µg/dscm	24590-HLW-3YD-HOP-00001, *System Description for the HLW Melter Offgas Treatment Process and Process Vessel Vent Exhaust (HOP and PVV Systems)*		WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III.10.J.1.b	Environmental	Can be quantified, but no limits are enforced. Emission is based on application of split factors.	The technical basis for this limit has not been evaluated.
36-5	Lead and Cadmium Emissions: Lead and cadmium emissions from the HLW Vitrification System shall not exceed 120 µg/dscm, combined.	24590-HLW-3YD-HOP-00001, *System Description for the HLW Melter Offgas Treatment Process and Process Vessel Vent Exhaust (HOP and PVV Systems)*		WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III.10.J.1.b	Environmental	Can be quantified, but no limits are enforced. Emission is based on application of split factors.	The technical basis for this limit has not been evaluated.
36-6	Arsenic, Beryllium, and Chromium Emissions: Arsenic, beryllium, and chromium emissions from the HLW Vitrification System shall not exceed 97 µg/dscm, combined.	24590-HLW-3YD-HOP-00001, *System Description for the HLW Melter Offgas Treatment Process and Process Vessel Vent Exhaust (HOP and PVV Systems)*		WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III.10.J.1.b	Environmental	Can be quantified, but no limits are enforced. Emission is based on application of split factors.	The technical basis for this limit has not been evaluated.
36-7	CO Emissions: Carbon monoxide emissions from the HLW Vitrification System will not exceed 100 ppm by volume, over an hourly rolling average (as measured and recorded by the continuous monitoring system), dry.	24590-HLW-3YD-HOP-00001, *System Description for the HLW Melter Offgas Treatment Process and Process Vessel Vent Exhaust (HOP and PVV Systems)*		WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III.10.J.1.b	Environmental	Mass is tracked, but cannot be quantified on an hourly basis. Emission is based on application of split factors.	The technical basis for this limit has not been evaluated.
36-8	Hydrocarbon Emissions: Hydrocarbon emission from the HLW Vitrification System will not exceed 10 ppm by volume, over an hourly rolling average (as measured and recorded by the continuous monitoring system during demonstration testing require by the Permit), dry basis, and reported as propane.	24590-HLW-3YD-HOP-00001, *System Description for the HLW Melter Offgas Treatment Process and Process Vessel Vent Exhaust (HOP and PVV Systems)*		WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III.10.J.1.b	Environmental	Only select hydrocarbons are tracked by mass and cannot be quantified on an hourly basis. Emission is based on application of split factors.	The technical basis for this limit has not been evaluated.
36-9	NO_x Emissions: Emission of NO_x from each HLW plant shall not exceed (based on 40 CFR 60, "Standards of Performance for New Stationary Sources," Appendix A, Method 7E, CEM) 352 ppmdv at 21% O_2, 24-hr averaging period or 23.3 lb/day when averaged over 30 consecutive days.	24590-HLW-3YD-HOP-00001, *System Description for the HLW Melter Offgas Treatment Process and Process Vessel Vent Exhaust (HOP and PVV Systems)*		PSD Air Permit Appendix A	Environmental	Tracked, but no limits are enforced. Emission is based on application of split factors.	The technical basis for this limit has not been evaluated.
36-10	PM10 Emission: Emission of PM10 from each HLW vitrification plant shall not exceed (based on 40 CFR 60, "Standards of Performance for New Stationary Sources," Appendix A, Method 5; 40 CFR 51, "Requirements for Preparation, Adoption, and Submittal of Implementation Plans," Appendix M, Method 201, or 201A for the front half analysis; and 40 CFR 51, Appendix M, Method 202 for the back half) 0.135 lb/hr 21% O_2, 24-hr averaging period. The unit shall be source tested every 5 years.	24590-HLW-3YD-HOP-00001, *System Description for the HLW Melter Offgas Treatment Process and Process Vessel Vent Exhaust (HOP and PVV Systems)*		PSD Air Permit Appendix A	Environmental	Not tracked or modeled.	The technical basis for this limit has not been evaluated.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
36-11	Opacity: Opacity from the each exhaust stack from HLW shall not exceed 5% over a 6-minute average as measured by EPA Reference Method 9, or an equivalent method approved in advance by Ecology. A certified opacity reader shall read and record the opacity concurrent with any source testing.	24590-HLW-3YD-HOP-00001, *System Description for the HLW Melter Offgas Treatment Process and Process Vessel Vent Exhaust (HOP and PVV Systems)*		Non-Rad Air Permit Condition 1.1	Environmental	Not tracked or modeled.	The technical basis for this limit has not been evaluated.
36-12	Process Inputs Basis of Design stack discharge from WTP-HLW: slurry density = 4.6E-02 to 4.7E-02 lb/ft^3, liquid density = n/a, viscosity = 0.026 cP, Na+ molarity = n/a.	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Not currently tracked or enforced.	These are maximum and minimum expected values, not necessarily the processing limits.
	Interface 37 – Secondary Solid Waste from WTP Facilities to Integrated Disposal Facility (IDF)	**Primary Stream: Secondary Waste**					
37-1	Activity limits for DOT-compliant waste packages	49 CFR 173, "Shippers—General Requirements for Shipments and Packagings"	49 CFR 173, "Shippers—General Requirements for Shipments and Packagings"	None	Environmental / safety	Not modeled	Assumes off-site treatment of mixed radioactive solid waste.
37-2	Waste Acceptance Criteria for Diversified Scientific Services' facility, TN (see Attachment B-1)	Attachment B-1: Waste Acceptance Criteria for Diversified Scientific Services' facility, TN	Attachment B-1: Waste Acceptance Criteria for Diversified Scientific Services' facility, TN	None	Environmental / safety	Not modeled	Assumes off-site treatment of mixed radioactive solid waste.
37-3	Waste Acceptance Criteria for PermaFix Northwest's facility, WA (see Attachment B-2)	Attachment B-2: PermaFix Northwest Low-Level Radioactive Waste Waste Acceptance Guidelines	Attachment B-2: PermaFix Northwest Low-Level Radioactive Waste Waste Acceptance Guidelines	None	Environmental / safety	Not modeled	Assumes off-site treatment of mixed radioactive solid waste.
37-4	Waste Acceptance Criteria for Materials & Energy Corporation's facility, TN (see Attachment B-3)	Attachment B-3: M&EC Facility Waste Acceptance Criteria	Attachment B-3: M&EC Facility Waste Acceptance Criteria	None	Environmental / safety	Not modeled	Assumes off-site treatment of mixed radioactive solid waste.
	Interface 38 – Immobilized HLW to WTP HLW Facility to Interim Hanford Storage (IHS)	**Primary Stream: Immobilized HLW**					
38-1	IHLW packages – projected transfer rate WTP HLW Facility Design Capacity: 7.5 MTG/day WTP HLW Facility Treatment Capacity: 5.25 MTG/day (1.74 IHLW canisters per day)	WTP Contract No. DE-AC27-01RV14136, *Design, Construction, and Commissioning of the Hanford Tank Waste Treatment and Immobilization Plant*,. C.7 Facility Specifications, Table C.7-1.1 WTP Facility Design Capacity	24590-WTP-ICD-MG-01-015, *ICD 15 – Interface Control Document for Immobilized Low Activity Waste*	ORP-11242, *River Protection Project System Plan* DOE/EM-0093, *Waste Acceptance Product Specifications for Vitrified High Level Waste Forms (WAPS)* DOE/RW-0351, *Waste Acceptance System Requirements Document (WASRD)* DOE/RW-0333P, *Quality Assurance Requirements and Description or the Office of Civilian Radioactive Waste Management* (QARD)	Environmental	The HLW Vitrification Facility will support a combined design capacity of 6 MTG per day with the two original melters, and 7.5 MTG per day with two second-generation melters, with a minimum integrated TOE of 70%. Multiplying the design capacity by the TOE yields treatment capacities of 4.2 MTG per day and 5.25 MTG per day, respectively.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
38-2	IHLW packages – fill height at least 87 percent of the volume of the empty canister.The average fill height over all the canisters shall be at least 95 percent of the volume of the empty canister.	WTP Contract No. DE-AC27-01RV14136, *Design, Construction, and Commissioning of the Hanford Tank Waste Treatment and Immobilization Plant,.* C.8 Operational Specifications, Specification 1: *Immobilized High Level Waste Product* 24590-HLW-PL-RT-07-0001, *IHLW Waste Form Compliance Plan for the Hanford Tank Waste Treatment and Immobilization Plant*	24590-WTP-ICD-MG-01-015, *ICD 15 – Interface Control Document for Immobilized Low Activity Waste*	DOE/EM-0093, *Waste Acceptance Product Specifications for Vitrified High Level Waste Forms (WAPS)* DOE/RW-0351, *Waste Acceptance System Requirements Document (WASRD)* DOE/RW-0333P, *Quality Assurance Requirements and Description for the Office of Civilian Radioactive Waste Management* (QARD)	Environmental	IHLW canisters are filled with 1.1352 m^3 of glass that has a mass of 3.02 MT. This mass is based on multiplying the volume times the density. The internal fill volume is based on filling the thick-walled (3/8-in. thick wall) canisters to 95% of the total capacity on average.	Requirements related to design of the package (e.g., overall dimensions, drop test, handling features) and requirements related the IHLW product (e.g., prohibited gases, chemical compatibility, subcriticality) are verified prior to shipment, therefore they are not considered an IFP. Requirements applicable at the time of shipment are listed as IFPs.
38-3	IHLW packages – maximum heat generation rate 1500 watts per canister	WTP Contract No. DE-AC27-01RV14136, *Design, Construction, and Commissioning of the Hanford Tank Waste Treatment and Immobilization Plant,.* C.8 Operational Specifications, Specification 1: Immobilized High Level Waste Product 24590-HLW-PL-RT-07-0001, *IHLW Waste Form Compliance Plan for the Hanford Tank Waste Treatment and Immobilization Plant*	24590-WTP-ICD-MG-01-015, *ICD 15 – Interface Control Document for Immobilized Low Activity Waste*	DOE/EM-0093, *Waste Acceptance Product Specifications for Vitrified High Level Waste Forms (WAPS)* DOE/RW-0351, *Waste Acceptance System Requirements Document (WASRD)* DOE/RW-0333P, *Quality Assurance Requirements and Description for the Office of Civilian Radioactive Waste Management (QARD)*	Environmental	Not modeled.	The IHS will be designed for a maximum individual canister heat load of 600 watts (RPP-23674) based on a projected actual canister maximum heat load of 525 watts. Recent WTP and TOC calculations (SVF-2432, *IHS Source Term*) indicate the projected actual canister heat load will not exceed 250 watts.
38-4	IHLW packages – surface contamination Removable contamination on the external surfaces of the package shall not exceed 3,670 Bq/m^2 for alpha and 36,700 Bq/m^2 for beta-gamma.	WTP Contract No. DE-AC27-01RV14136, as amended, *Design, Construction, and Commissioning of the Hanford Tank Waste Treatment and Immobilization Plant,.* C.8 Operational Specifications, Specification 1: Immobilized High Level Waste Product 24590-HLW-PL-RT-07-0001, *IHLW Waste Form Compliance Plan for the Hanford Tank Waste Treatment and Immobilization Plant*	24590-WTP-ICD-MG-01-015, *ICD 15 – Interface Control Document for Immobilized Low Activity Waste*	DOE/EM-0093, *Waste Acceptance Product Specifications for Vitrified High Level Waste Forms (WAPS)* DOE/RW-0351, *Waste Acceptance System Requirements Document (WASRD)* DOE/RW-0333P, *Quality Assurance Requirements and Description for the Office of Civilian Radioactive Waste Management (QARD)*	Environmental	Canister decontamination procedures are taken from 24590-WTP-MDD-PR-01-0002, which does not document the degree or kind of contamination on the outside of the IHLW canister vessel expected from pouring the IHLW from the melter into the canisters.	
	Interface 39 – Immobilized HLW from Interim Hanford Storage (IHS) to Hanford Shipping Facility	**Primary Stream: Immobilized HLW**					
39-1	IHLW packages	RPP-23674, *Immobilized High-*	TBD	DOE/EM-0093, *Waste*	TBD	Not modeled.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
		Level Waste Interim Hanford Storage System Specification RPP-RPT-52176, *Interim Hanford Storage Conceptual Design Report*		*Acceptance Product Specifications for Vitrified High Level Waste Forms (WAPS)* DOE/RW-0351, *Waste Acceptance System Requirements Document (WASRD)* DOE/RW-0333P, *Quality Assurance Requirements and Description for the Office of Civilian Radioactive Waste Management (QARD)*			
	Interface 40 – Immobilized HLW from Hanford Shipping Facility to Federal Geologic Nuclear Waste Repository	**Primary Stream: Immobilized HLW**					
40-1	IHLW packages	RPP-23674, *Immobilized High-Level Waste Interim Hanford Storage System Specification* RPP-RPT-52176, *Interim Hanford Storage Conceptual Design Report*	TBD	DOE/EM-0093, *Waste Acceptance Product Specifications for Vitrified High Level Waste Forms (WAPS)* DOE/RW-0351, *Waste Acceptance System Requirements Document (WASRD)* DOE/RW-0333P, *Quality Assurance Requirements and Description for the Office of Civilian Radioactive Waste Management (QARD)*	TBD	Not modeled.	
	Interface 41a – LAW from WTP PT to WTP LAW						
41a-1	The volumetric transfer rate during actual transfer is 88 gpm.	24590-WTP-RPT-PT-02-005, *Flowsheet Bases, Assumptions, and Requirements*, Section 3.1.3.1.1 and Appendix B 24590-LAW-MVC-LCP-00002, *LAW Concentrate Receipt Process System (LCP) Data* 24590-PTF-MPD-TCP-00006, *TCP-PMP-00001A/B-Treated LAW Concentrate Transfer Pump*			Operations	Modeled as 88 gpm.	Flow rate is based on the rating of the transfer pump.
41a-2	The Cs-137 concentration will be no greater than its equivalent in ILAW of 0.3 Ci/m^3 to facilitate the maintenance concept established for the LAW	WTP Contract No. DE-AC27-01RV14136, *Design,*		Not identified.	Technical (calculated)	Not currently tracked or enforced.	This IFP requires the glass loading and other

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
	Melter System.	*Construction, and Commissioning of the Hanford Tank Waste Treatment and Immobilization Plant*					parameters to be known before the treated LAW is transferred to WTP-LAW. Since recycle is included in glass, this IFP will always be somewhat indeterminate as written.
41a-3	Sr/TRU concentrations shall be below ILAW Waste Product Specification 2.2.2.8, radionuclide concentration limitations for class "C" limits without dilution of the glass for the purpose of meeting the radionuclide concentration limits.	WTP Contract No. DE-AC27-01RV14136, *Design, Construction, and Commissioning of the Hanford Tank Waste Treatment and Immobilization Plant*		10 CFR 61.55, "Waste Classification"	Regulatory	Not currently tracked or enforced.	This IFP requires the glass loading and other parameters to be known before the treated LAW is transferred to WTP-LAW. Since recycle is included in glass, this IFP will always be somewhat indeterminate as written.
41a-4	WTP-PTF sends batches of treated LAW to WTP-LAW at 32-hour intervals, to meet production rates. Each batch is 9,115 gal.	24590-PTF-3YD-TCP-00001, *System Description for the Treated LAW Concentrate Storage Process (TCP)*, Section 6.1 24590-WTP-RPT-PT-02-005, *Flowsheet Bases, Assumptions, and Requirements*, Section 3.1.3.1.2 and Appendix F			Technical (calculated)	Batches are fed on demand (when the LCP vessel reaches its lower setpoint). Batch volume is modeled as 9,115 gal.	
41a-5	Transfer Line Flushes: Each transfer from WTP-PTF to WTP-LAW is followed with one line-volume of flush to the concentrate receipt vessels (LCP-VSL-00001/2) followed by two line-volumes of demineralized water from LCP to PWD-VSL-00033 to remove residual solids and minimize corrosion. The total flush volume is 2,191 gal.	24590-PTF-3YD-TCP-00001, *System Description for the Treated LAW Concentrate Storage Process (TCP)*, Sections 7.2, 7.2.4		Email CCN 139031, "Flushing and Draining of LAW Transfer Lines" 24590-LAW-M0C-20-00006, *LAW Concentrate Receipt and Melter Feed Line Volumes*	Technical (assumed)	Line flushes are not modeled for this transfer.	
41a-6	Process Inputs for Basis of Design treated LAW from WTP-PTF: slurry density = 80.7 to 85.7 lb/ft3, liquid density = 80.7 to 85.6 lb/ft^3, viscosity = 4.3 to 5.1 cP, Na+ molarity = 7.5 to 8.4.	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Not currently tracked or enforced.	These are maximum and minimum expected values, not necessarily the processing limits.
	Interface 41b – Secondary Liquid Waste from WTP LAW to WTP PT						
41b-1	Process Inputs Basis of Design LAW effluent sent to WTP-PTF (from RLD-VSL-00005 to TLP-VSL-00009A/B): slurry density = 62.4 to 62.6 lb/ft^3, liquid density = n/a, viscosity = 0.5 to 0.5 cP, Na+ molarity = 0.1 to 0.2.	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Not currently tracked or enforced.	These are max and min expected values, not the processing limits.
41b-2	Process Inputs Basis of Design for LAW miscellaneous washes sent to Pretreatment Facility (Stream RLD27 in PIBOD from RLD-VSL-00003 to PWD-VSL-00044): slurry density = 63.3 to 63.7 lb/ft^3, liquid density =	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Not currently tracked or enforced.	These are max and min expected values, not the processing limits.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
	n/a, viscosity = 0.5 to 0.5 cP, Na+ molarity = 0.1 to 0.2.						
41b-3	Excess scrubber fluid sent to Pretreatment Facility (from LVP-TK-00001 to RLD-VSL-00017A/B): slurry density = 65.7 to 65.8 lb/ft^3, liquid density = n/a, viscosity = 0.5 to 0.5 cP, Na+ molarity = 0.0 to 0.1.	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Not currently tracked or enforced.	
41b-4	Transfer line flush after LAW effluent transfer from RLD-VSL-00005 to TLP-VSL-00009A/B): a transfer line flush of one pipe volume is performed.	24590-LAW-3YD-RLD-00001, *System Description Document for the Law Radioactive Liquid Waste Disposal (RLD) System*, Section 7.2.3			Technical	Line flushes are not modeled for this transfer.	
41b-5	Transfer line flush after LAW miscellaneous wash transfer from RLD-VSL-00003 to PWD-VSL-00044): a transfer line flush of one pipe volume is performed.	24590-LAW-3YD-RLD-00001, *System Description Document for the Law Radioactive Liquid Waste Disposal (RLD) System*, Section 7.2.3			Technical	Line flushes are not modeled for this transfer.	
	Interface 42 – Offgas from WTP LAW to Stack						
42-1	HCl and Cl_2 Gas Emissions: Hydrochloric acid and chlorine gas emissions from the LAW Vitrification System shall not exceed 21 ppmv, combined.	24590-LAW-3YD-LOP-00001, *System Description for the LAW Primary Offgas (LOP) and Secondary Offgas/Vessel Vent (LVP) Systems*		WTP Dangerous Waste Permit III.10.H.1.b.iii	Regulatory	HCl can be quantified; chlorine is not tracked. No limits are enforced. Emissions are based on application of split factors.	The technical basis for this limit has not been evaluated.
42-2	Particulate Matter Emissions: Particulate matter emissions from the LAW Vitrification System will not exceed 34 mg/dscm (0.015 grains/dscf).	24590-LAW-3YD-LOP-00001, *System Description for the LAW Primary Offgas (LOP) and Secondary Offgas/Vessel Vent (LVP) Systems*		WTP Dangerous Waste Permit III.10.H.1.b.ii	Regulatory	Not currently tracked or enforced.	The technical basis for this limit has not been evaluated.
42-3	Dioxin and Furan TEQ Emissions: Dioxin and furan TEQ emissions from the LAW Vitrification System shall not exceed 0.2 ng/dscm.	24590-LAW-3YD-LOP-00001, *System Description for the LAW Primary Offgas (LOP) and Secondary Offgas/Vessel Vent (LVP) Systems*		WTP Dangerous Waste Permit III.10.H.1.b.iv	Regulatory	Not currently tracked or enforced.	The technical basis for this limit has not been evaluated.
42-4	Mercury Emissions: Mercury emissions from the LAW Vitrification System will not exceed 45 µg/dscm	24590-LAW-3YD-LOP-00001, *System Description for the LAW Primary Offgas (LOP) and Secondary Offgas/Vessel Vent (LVP) Systems*		WTP Dangerous Waste Permit III.10.H.1.b.v	Regulatory	Can be quantified, but no limits are enforced. Emission is based on application of split factors.	The technical basis for this limit has not been evaluated.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
42-5	Lead and Cadmium Emissions: Lead and cadmium emissions from the LAW Vitrification System will not exceed 120 µg/dscm, combined.	24590-LAW-3YD-LOP-00001, *System Description for the LAW Primary Offgas (LOP) and Secondary Offgas/Vessel Vent (LVP) Systems*		WTP Dangerous Waste Permit III.10.H.1.b.vi	Regulatory	Can be quantified, but no limits are enforced. Emission is based on application of split factors.	The technical basis for this limit has not been evaluated.
42-6	Arsenic, Beryllium, and Chromium Emissions: Arsenic, beryllium, and chromium emissions from the LAW Vitrification System shall not exceed 97 µg/dscm, combined.	24590-LAW-3YD-LOP-00001, *System Description for the LAW Primary Offgas (LOP) and Secondary Offgas/Vessel Vent (LVP) Systems*		WTP Dangerous Waste Permit III.10.H.1.b.vii	Regulatory	Can be quantified, but no limits are enforced. Emission is based on application of split factors.	The technical basis for this limit has not been evaluated.
42-7	CO Emissions: Carbon monoxide emissions from the HLW Vitrification System will not exceed 100 ppm by volume, over an hourly rolling average (as measured and recorded by the continuous monitoring system), dry.	24590-LAW-3YD-LOP-00001, *System Description for the LAW Primary Offgas (LOP) and Secondary Offgas/Vessel Vent (LVP) Systems*		WTP Dangerous Waste Permit III.10.H.1.b.viii	Regulatory	Mass is tracked, but cannot be quantified on an hourly basis. Emission is based on application of split factors.	The technical basis for this limit has not been evaluated.
42-8	Hydrocarbon Emissions: Hydrocarbon emission from the LAW Vitrification System will not exceed 10 ppm by volume, over an hourly rolling average (as measured and recorded by the continuous monitoring system during demonstration testing require by the Permit), dry basis, and reported as propane.	24590-LAW-3YD-LOP-00001, *System Description for the LAW Primary Offgas (LOP) and Secondary Offgas/Vessel Vent (LVP) Systems*		WTP Dangerous Waste Permit III.10.H.1.b.ix	Regulatory	Only select hydrocarbons are tracked by mass and cannot be quantified on an hourly basis. Emission is based on application of split factors.	The technical basis for this limit has not been evaluated.
42-9	NO_x Emissions: Emissions of NO_x from each LAW vitrification plant shall not exceed 477 ppmdv at 21% O_2 averaged over 24 consecutive hours or 200.11 pounds per day averaged over 30 consecutive days.	24590-LAW-3YD-LOP-00001, *System Description for the LAW Primary Offgas (LOP) and Secondary Offgas/Vessel Vent (LVP) Systems*		PSD Air Permit Approval Condition 4	Regulatory	Tracked, but no limits are enforced. Emission is based on application of split factors.	The technical basis for this limit has not been evaluated.
42-10	PM and PM10 Emission: Emissions of PM or PM10 from each LAW vitrification plant shall not exceed 0.36 lb/hr at 21% O_2 when averaged over 24 consecutive hours.	24590-LAW-3YD-LOP-00001, *System Description for the LAW Primary Offgas (LOP) and Secondary Offgas/Vessel Vent (LVP) Systems*		PSD Air Permit Approval Condition 5	Regulatory	Not tracked or modeled.	The technical basis for this limit has not been evaluated.
42-11	Process Inputs Basis of Design stack discharge from WTP-LAW: slurry density = 5.6E-02 lb/ft^3, liquid density = n/a, viscosity = 0.018 to 0.019 cP, Na+ molarity = n/a.	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Not currently tracked or enforced.	These are maximum and minimum expected values, not necessarily the processing limits.
	Interface 43 – Immobilized LAW from WTP LAW Facility to Integrated Disposal Facility (IDF)	**Primary Stream: Immobilized LAW**					
43-1	ILAW packages – projected transfer rate WTP LAW Facility Design Capacity: 30 MTG/day (5 ILAW packages per day) WTP LAW Facility Treatment Capacity: 21 MTG/day	WTP Contract No. DE-AC27-01RV14136, as amended, *Design, Construction, and Commissioning of the Hanford Tank Waste Treatment and Immobilization Plant.* C.7 Facility Specifications Table C.7-1.1 WTP Facility	24590-WTP-ICD-MG-01-015, *ICD 15 – Interface Control Document for Immobilized Low Activity Waste*	ORP-11242, *River Protection Project System Plan* RPP-32071, ILAW Waste Form Technical Requirements Document (IWTRD)	Operational	The ILAW is collected in the LAW-CANISTERS vessel where the number of containers is determined based on assumed values for the container volume and mass. The containers are	Need new IDF WAC or update to RPP-8402, *Waste Acceptance Criteria for the Immobilized Low Activity Waste Disposal Facility*.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
		Design Capacity				totaled for the mission summary (HTWOS-LAW-CANISTER-LOGGER). Storage of the containers is not modeled. The design capacity of the LAW Vitrification Facility is 30 MTG per day, and the treatment capacity is 21 MTG per day. The net rate is the realized capacity and treatment capacity is obtained by multiplying the design capacity (30 MTG/d) times the total operating efficiency (TOE). The TOE for the WTP LAW melter at full capacity is 70%.	
43-2	ILAW packages – maximum weight 10,000 kilograms (22,046 lbs.)	WTP Contract No. DE-AC27-01RV14136, as amended, *Design, Construction, and Commissioning of the Hanford Tank Waste Treatment and Immobilization Plant*,. C.8 Operational Specifications, Specification 2: Immobilized Low Activity Waste Product 24590-WTP-PL-RT-03-001, *ILAW Product Compliance Plan*	24590-WTP-ICD-MG-01-015, *ICD 15 – Interface Control Document for Immobilized Low Activity Waste*	RPP-8402, *Waste Acceptance Criteria for the Immobilized Low Activity Waste Disposal Facility* WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 11, "Integrated Disposal Facility" DOE/RL-2001-36, *Hanford Site wide Transportation Safety Document*, Appendix I.7, ILAW SPA (Special Packaging Authorization)	Operational	Each ILAW container has an internal volume of 2.135 m^3. The mass of glass in each container is calculated to be 5.51 MT of LAW glass, which is the glass density of 2.58 MT/m^3 times the container volume of 2.135 m^3. Some calculation use 2.7 kg/L for glass density, which would result in 5.7 MT of LAW per can. That amount is still not enough to reach 5 cans/day at 30 MTG/day. To reach 5 cans/day, the glass density must allow for 6 MTG/can, which would be 2.81 MT/m^3. The System Plan (ORP-11242 assumes 5.5 MTG/can.	Requirements related to design of the package (e.g., structural, shielding, containment) and requirements related the ILAW product (e.g., gas generation, fissile payload, flammable gas concentration) are verified prior to shipment, therefore they are not considered an IFP. Requirements applicable at the time of shipment are listed as IFPs.
43-3	ILAW packages – maximum surface dose rate 500 mrem/hr	WTP Contract No. DE-AC27-01RV14136, as amended,	24590-WTP-ICD-MG-01-015, *ICD 15 – Interface Control*	WA7890008967, *Hanford Facility Resource Conservation*	Environmental	Not modeled.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
		Design, Construction, and Commissioning of the Hanford Tank Waste Treatment and Immobilization Plant, C.8 Operational Specifications, Specification 2: Immobilized Low Activity Waste Product 24590-WTP-PL-RT-03-001, *ILAW Product Compliance Plan*	*Document for Immobilized Low Activity Waste*	*and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 11, "Integrated Disposal Facility" DOE/RL-2001-36, *Hanford Sitewide Transportation Safety Document*, Appendix I.7, ILAW SPA (Special Packaging Authorization)			
43-4	ILAW packages – maximum surface contaminationRemovable contamination on the external surfaces of the package shall not exceed 367 Bq/m^2 for alpha and 3,670 Bq/m^2 for beta-gamma contamination.	WTP Contract No. DE-AC27-01RV14136, *Design, Construction, and Commissioning of the Hanford Tank Waste Treatment and Immobilization Plant.*, C.8 Operational Specifications, Specification 2: Immobilized Low Activity Waste Product 24590-WTP-PL-RT-03-001, *ILAW Product Compliance Plan*	24590-WTP-ICD-MG-01-015, *ICD 15 – Interface Control Document for Immobilized Low Activity Waste*	RPP-8402, *Waste Acceptance Criteria for the Immobilized Low Activity Waste Disposal Facility* WA7890008967,, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 11, "Integrated Disposal Facility" DOE/RL-2001-36, *Hanford Sitewide Transportation Safety Document*, Appendix I.7, ILAW SPA (Special Packaging Authorization)	Environmental	Not modeled.	
43-5	ILAW packages – maximum temperature 465 °F (alternating pour) or 550 °F (single pour) Actual temperatures of ILAW product packages loaded on to the Transporter are not expected to exceed 200 °F.	WTP Contract No. DE-AC27-01RV14136, *Design, Construction, and Commissioning of the Hanford Tank Waste Treatment and Immobilization Plant.* C.8 Operational Specifications, Specification 2: Immobilized Low Activity Waste Product 24590-WTP-PL-RT-03-001, *ILAW Product Compliance Plan*	24590-WTP-ICD-MG-01-015, *ICD 15 – Interface Control Document for Immobilized Low Activity Waste*	RPP-8402, *Waste Acceptance Criteria for the Immobilized Low Activity Waste Disposal Facility* WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 11, "Integrated Disposal Facility" DOE/RL-2001-36, *Hanford Sitewide Transportation Safety Document*, Appendix I.7, ILAW SPA (Special Packaging Authorization)	Operational	Not modeled.	
	Interface 44 – Solid Waste from WTP Facility to WIPP	**Primary Stream: Waste**					

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
44-1	55 gal drums – projected quantity 4 RH-TRUM every 2.5 years	24590-WTP-PL-RT-03-003, *Secondary Wastes Compliance Plan*	24590-WTP-ICD-MG-01-003, *ICD 03 – Interface Control Document for Radioactive Solid Waste*	24590-WTP-RPT-ENS-10-010, *WTP Estimate of Secondary Radioactive Solid Waste Generation* DOE/WIPP-02-3122, *Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant*	Operations	Not modeled.	
44-2	Overpacks – projected quantity 2 CH-TRUM every 5 years	24590-WTP-PL-RT-03-003, *Secondary Wastes Compliance Plan*	24590-WTP-ICD-MG-01-003, *ICD 03 – Interface Control Document for Radioactive Solid Waste*	24590-WTP-RPT-ENS-10-010, *WTP Estimate of Secondary Radioactive Solid Waste Generation* DOE/WIPP-02-3122, *Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant*	Operations	Not modeled.	
	Interface 45 – LAW from WTP PT to SLAW Immobilization						
45a-1	The Cs-137 concentration will be no greater than its equivalent in ILAW of 0.3 Ci/m^3 to facilitate the maintenance concept established for the LAW Melter System.	WTP Contract No. DE-AC27-01RV14136		Not identified.	Technical (calculated)	Not currently tracked or enforced.	This IFP requires the glass loading and other parameters to be known before the treated LAW is transferred to WTP-LAW. Since recycle is included in glass, this IFP will always be somewhat indeterminate as written.
45a-2	Sr/TRU concentrations shall be below ILAW Waste Product Specification 2.2.2.8, radionuclide concentration limitations for class "C" limits without dilution of the glass for the purpose of meeting the radionuclide concentration limits.	WTP Contract No. DE-AC27-01RV14136		10 CFR 61.55, "Waste Classification"	Regulatory	Not currently tracked or enforced.	This IFP requires the glass loading and other parameters to be known before the treated LAW is transferred to WTP-LAW. Since recycle is included in glass, this IFP will always be somewhat indeterminate as written.
	Interface 46 – LAW from LAW PS to SLAW Immobilization						
46-1	IFPs are similar to those in interface 28				N/A		
	Interface 47 – Off-gas from SLAW Immobilization to Stack						

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
47-1	Off-gas from Supplemental LAW facility stack shall meet air emissions limits identified in DOE Order 5400.5 and WTP Air Permit	Letter CCN 248324, "Preliminary Investigation of Waste Acceptance Criteria and Process Requirements Related to Direct Law Feed"		24590-WTP-DB-ENG-01-001, *Basis of Design*	Environmental	Concentration of components in stack off-gas is based on application of split factors.	
	Interface 48 – Secondary liquid waste from SLAW Immobilization to LERF/ETF						
48-1	IFPs are similar to interface 25 (assuming second LAW vitrification).				N/A		
	Interface 49 – Immobilized LAW from SLAW Immobilization to Integrated Disposal Facility (IDF)	**Primary Stream: Immobilized LAW**					
49-1	TBD Technology for SLAW Immobilization not selected at this time.						
	Interface 50– Offgas from WTP PT to Stack						
50-1	Process Inputs Basis of Design, stack discharge from WTP-PTF pulse jet ventilation system: slurry density = 7.3E-02 to 7.6E-02 lb/ft^3, liquid density = n/a, viscosity = 0.018 to 0.019 cP, Na+ molarity = n/a.	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, Rev. 2, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Not currently tracked or enforced.	These are max and min expected values, not the processing limits.
50-2	Process Inputs Basis of Design stack discharge from WTP-PTF vessel vent stack: slurry density = 5.0E-02 lb/ft3, liquid density = n/a, viscosity = 0.026 cP, Na+ molarity = n/a.	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Not currently tracked or enforced.	These are max and min expected values, not the processing limits.
	Interface 51 – Secondary liquid waste from WTP Pretreatment Facility to LERF/ETF						
51-1	IFPs are similar to those in stream 25.				N/A		
51-2	The design pressure for both radioactive, dangerous liquid effluent pipelines (4" inner diameter primary pipe and 3" inner diameter backup pipe) is 100 psig at 120 ^{0}F. Due to the design pressure limit, transfers made through the 4" diameter primary pipe will allow approximately 170 gpm instantaneous flow rate while the 3" diameter backup line will be limited to about 90 gpm.	24590-WTP-ICD-MG-01-006, *ICD-06 – Interface Control Document for Radioactive, Dangerous Liquid Effluents*		W-519-P1, *Performance Specification, Liquid Effluent Transfer System*	Safety/ Operation	Modeled flow rates vary depending on the source. Flow rates are generally less than 170 gpm.	
	Interface 52 – Secondary Waste from Tank Farms to LDR Treatment						
52-1	Same as interface 37-1						
52-2	Same as interface 37-2						
52-3	Same as interface 37-3						
52-4	Same as interface 37-4						
	Interface 53 – Waste Samples from Tank Farms to Outside Lab Facility						
53-1	To be addressed in a future revision						
	Interface 54 – Waste Samples from Outside Lab Facility to WTP Lab Facility						

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
54-1	To be addressed in a future revision						
	Interface 55 – Offgas from WTP Lab Facility to Stack						
55-1	TBD						
	Interface 56a – Waste Samples from WTP Pretreatment Facility to WTP Lab Facility						
56a-1	Hold Point Samples from FRP-VSL-00002A/B/C: 2 samples from each of the three waste feed receipt vessels are required for each waste type received. 47 samples/year with 2 day (48 hour) turnaround between initiation of sampling to the time the results are required.	24590-WTP-PL-PR-04-0001, *Integrated Sampling and Analysis Requirements Document (ISARD)*, Appendix B and C			Safety	Not modeled.	Liquid and solid fractions from each sample are analyzed to verify that the waste is within criticality limits (Sample point PT2 in ISARD). Liquid and whole sample fractions from one sample per tank are analyzed to verify that the compositions and physical properties are within processing parameters (Sample point PT2a in ISARD).
56a-2	Hold Point Samples from HLP-VSL-00022: 2 samples from the HLW feed receipt vessel are required for each waste type received. 12 samples/year with 2-day (48-hour) turnaround between initiation of sampling to the time the results are required.	24590-WTP-PL-PR-04-0001, *Integrated Sampling and Analysis Requirements Document (ISARD)*, Appendix B and C			Safety	Not modeled.	Liquid and solid fractions from each sample are analyzed to verify that the waste is within criticality limits (Sample point PT17 in ISARD). Liquid and whole sample fractions from each sample are analyzed to determine the processing flowsheet conditions and any adjustments required for the feed (Sample point PT17a and PT17b in ISARD).
56a-3	Hold Point Samples from CXP-VSL-00026A/B/C: 1 sample from the ion exchange treated LAW collection vessels is required before every transfer, once every 24 hours. 365 samples/year with 1 day (24-hour) turnaround between initial of sampling to the time the results are required.	24590-WTP-PL-PR-04-0001, *Integrated Sampling and Analysis Requirements Document (ISARD)*, Appendix B and C			Technical	Not modeled.	Samples are analyzed for process control to ensure: sufficient removal of Cs-137, ILAW package will meet dose rate and TRU limits (Sample point PT28 in ISARD).
	Interface 56b – Secondary Liquid Waste from WTP Lab Facility to WTP Pretreatment Facility						
56b-1	TBD						

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
	Interface 57 – Waste Samples from WTP LAW Facility to WTP Lab Facility						
57-1	Hold Point Samples from LCP-VSL-00001/2: 3 samples per sampling event are required from the LAW concentrate receipt vessel. There will be 2 sampling events every 64 hours. 821.25 samples/year with 1.33 day (32 hour) turnaround between initiation of sampling to the time the results are required.	24590-WTP-PL-PR-04-0001, *Integrated Sampling and Analysis Requirements Document (ISARD)*, Appendix B and C			Technical/ Operations	Not modeled.	Samples are analyzed to determine the GFC additives required to produce acceptable LAW melter feed; GFCs cannot be added until the analyses are complete (Sample point LAW1a in ISARD).
	Interface 58 – Waste Samples from WTP HLW Facility to WTP Lab Facility						
58-1	The MFPV shall be characterized by analyzing each batch transfer of HLW feed concentrate from the PT facility to confirm that it can be vitrified within the acceptable glass composition region after GFC addition, to confirm before vitrification that specific limits for compliance with specifications shall not be exceeded, and shall provide sufficient composition information to calculate the correct GFC addition.	24590-HLW-3YD-HFP-00001, *System Description for HLW Concentrate Receipt Process and HLW Melter Feed Process Systems (HCP & HFP)* (Section 4.5.1)			Technical/ Operations	Not modeled.	
58-2	Following GFC addition, the resulting melter feed in the MFPV shall be re-sampled to confirm the GFCs have been added correctly, determine chemical and radionuclide composition for reporting during production (WAPS Specification 1.1.2 and 1.2.2), product consistency control (WAPS Specification 1.3), and delisting compliance (WAPS Specification 1.5)	24590-HLW-3YD-HFP-00001, *System Description for HLW Concentrate Receipt Process and HLW Melter Feed Process Systems (HCP & HFP)* (Section 4.5.1)			Technical/ Operations	Not modeled.	
58-3	During operations, the WTP shall expect to provide replicate sampling and analyses of the MFPV to achieve 90% confidence that the reported value of the analytes are within ±10% of the true value. This MFPV melter feed sample shall be a compliance hold point.	24590-HLW-3YD-HFP-00001, *System Description for HLW Concentrate Receipt Process and HLW Melter Feed Process Systems (HCP & HFP)* (Section 4.5.1)			Technical/ Operations	Not modeled.	
58-4	Initial Hold Point Samples from HFP-VSL-00001/5: 4 samples from the HLW melter feed prep vessels are required after the completion of a batch transfer from the PT facility and sufficient mixing. 1,229 samples/year with 0.41 day (10-hour) turnaround between initial of sampling to the time the results are required.	24590-WTP-PL-PR-04-0001, *Integrated Sampling and Analysis Requirements Document (ISARD)*, Appendix B and C			Technical/ Operations	Not modeled.	Samples are analyzed to ensure the waste is within acceptable limits and to determine the glass former recipe that will produce glass that is in the Qualified Glass Composition Region (Sample point HLW2a in ISARD).
58-5	Final Hold Point Samples from HFP-VSL-00001/5: 8 samples from the HLW melter feed prep vessels are required after the addition of GFCs and sufficient mixing. 2,459 samples/year with 0.38day (9-hour) turnaround between initial of sampling to the time the results are required.	24590-WTP-PL-PR-04-0001, *Integrated Sampling and Analysis Requirements Document (ISARD)*, Appendix B and C			Technical/ Operations	Not modeled.	Samples are analyzed to ensure the waste is within acceptable limits and to determine the glass former recipe (Sample point

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
							HLW2b in ISARD).
	Interface 59a – Utilities from WTP Balance of Facilities to WTP Lab Facility						
59a-1	TBD						
	Interface 59b – Wastewater from WTP Lab Facility to WTP Balance of Facilities						
59b-1	TBD						
	Interface 60a – Utilities from WTP Balance of Facilities to WTP Pretreatment Facility						
60a-1	Antifoam from Balance of Facilities to Pretreatment Facility (Stream FEP11, TLP08 in PIBOD): slurry density = 62.4 to 62.5 lb/ft^3, liquid density = 62.4 to 62.5 lb/ft^3, viscosity = 0.9 cP, Na+ molarity = 0.0.	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Not modeled.	These are not flowsheet limits, just physical properties of the interface.
60a-2	NaOH from Balance of Facilities to Pretreatment Facility 19 M NaOH (Stream FEP21, UFP01, UFP06, UFP51, HLP14, HLP15, HLP16, PWD05, PWD14 in PIBOD): slurry density = 95.55 lb/ft^3, liquid density = 95.55 lb/ft^3, viscosity = 85 cP, Na+ molarity = 18.9 to 19.0. 5 M NaOH (Stream CNP20, CRP09, TLP05, PVP02 in PIBOD): slurry density = 74.39 lb/ft^3, liquid density = 74.39 lb/ft^3, viscosity = 3 cP, Na+ molarity = 4.9 to 5.0. 2 M NaOH (Stream UFP26, UFP43, CRP09 in PIBOD): slurry density = 67.78 lb/ft^3, liquid density = 67.78 lb/ft^3, viscosity = 1.3 cP, Na+ molarity = 1.9 to 2.0. 0.5 M NaOH (Stream CXP06, CXP07 in PIBOD): slurry density = 63.15 lb/ft^3, liquid density = 63.15 lb/ft^3, viscosity = 1.1 cP, Na+ molarity = 0.4 to 0.5. 0.1 M NaOH (Stream CXP03 in PIBOD): slurry density = 63.15 lb/ft^3, liquid density = 63.15 lb/ft^3, viscosity = 1.1 cP, Na+ molarity = 0.4 to 0.5.	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Quantified but not specifically modeled.	These are not flowsheet limits, just physical properties of the stream
60a-3	$Sr(NO_3)_2$ from Balance of Facilities to Pretreatment Facility (1 M concentration) (Stream UFP02 in PIBOD): [properties are not provided in PIBOD]	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Quantified but not specifically modeled.	These are not flowsheet limits, just physical properties of the stream.
60a-4	$NaMnO_4$ from Balance of Facilities to Pretreatment Facility (1 M concentration) (Stream UPF03, UFP13 in PIBOD): slurry density = 68.5 to 68.6 lb/ft^3, liquid density = 67.0 to 67.1 lb/ft^3, viscosity = 1.2 cP, Na+ molarity = 0.9 to 1.0	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Quantified but not specifically modeled.	These are not flowsheet limits, just physical properties of the stream.
60a-5	HNO_3 from Balance of Facilities to Pretreatment Facility 5 to 8 M HNO_3 (Stream CNP01 in PIBOD): slurry density = 73.3 to 78 lb/ft^3, liquid density = 73.3 to 78 lb/ft^3, viscosity = 1.0 to 2.0 cP, Na+ molarity = 0. 2 M HNO_3 (Stream UFP25, UFP42 , CNP15in PIBOD): slurry density = 66.6 lb/ft^3, liquid density = 66.6 lb/ft^3, viscosity = 0.9 cP, Na+ molarity = 0. 0.5 M HNO_3 (Stream CXP17, CRP10 in PIBOD): slurry density = 63.2 to 63.3 lb/ft^3, liquid density = 63.2 to 63.3 lb/ft^3, viscosity = 0.9 cP, Na+ molarity = 0 to 0.1.	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Quantified but not specifically modeled.	These are not flowsheet limits, just physical properties of the stream.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
60a-6	Demineralized water from Balance of Facilities to Pretreatment Facility (Stream CXP04, CXP05, CRP03, CRP04, RDP12, RDP13 in PIBOD): slurry density = 62.4 to 62.5 lb/ft^3, liquid density = 62.2 to 62.3 lb/ft^3, viscosity = 0.9 cP, Na+ molarity = 0	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Quantified but not specifically modeled.	These are not flowsheet limits, just physical properties of the stream.
60a-7	Water from Balance of Facilities to Pretreatment Facility (Stream PJV05, PVP05, PVP14, PVP15 in PIBOD): slurry density = 62.4 to 62.5 lb/ft^3, liquid density = 62.4 to 62.5 lb/ft^3, viscosity = 0.9 cP, Na+ molarity = 0.	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Quantified but not specifically modeled.	These are not flowsheet limits, just physical properties of the stream.
60a-8	Ion Exchange Resin from Balance of Facilities to Pretreatment Facility (Stream CRP08 in PIBOD): [properties are not provided in PIBOD]	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Quantified but not specifically modeled.	These are not flowsheet limits, just physical properties of the stream.
60a-9	Raw water to PTF cooling tower facility: the requirement during the peak cooling tower makeup period is 190 gpm [Section 3, *ICD 01 – Raw Water*]	24590-BOF-3YD-RWW-00001, *System Description for Raw Water System (RWW)*, Table 10-1		24590-BOF-M6C-RWW-00001, *Design Pressure and Temperature Calculation for Raw Water (RWW) System*	Technical (calculated)	Not modeled.	24590-BOF-M6C-RWW-00001 has not been examined to verify that it is the technical basis.
	Interface 60b – Wastewater from WTP Pretreatment Facility to WTP Balance of Facilities						
60b-1	TBD						
	Interface 61a – Utilities from WTP Balance of Facilities to WTP LAW Facility						
61a-1	Ammonia from Balance of Facilities to LAW Facility (Stream AMR03 in PIBOD): slurry density = 4.36E-02 lb/ft^3, liquid density = n/a, viscosity = 0.014 cP, Na+ molarity = n/a.	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Not modeled.	These are not flowsheet limits, just physical properties of the stream.
61a-2	NaOH from Balance of Facilities to LAW Facility (5 M concentration) (Stream LVP19 in PIBOD): slurry density = 74.39 lb/ft^3, liquid density = n/a, viscosity = 3.0 cP, Na+ molarity = 4.9 to 5.0	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Quantified, but not specifically modeled.	These are not flowsheet limits, just physical properties of the stream.
61a-3	Water from Balance of Facilities to LAW Facility (Stream LMP04, LVP20 in PIBOD): slurry density = 62.4 lb/ft^3, liquid density = n/a, viscosity = 0.9 cP, Na+ molarity = 0	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Quantified, but not specifically modeled.	These are not flowsheet limits, just physical properties of the stream.
61a-4	Blended glass formers from Balance of Facilities to LAW Facility (same as Stream LFP01 in PIBOD): slurry density = 129.0 to 136.0 lb/ft^3, liquid density = n/a, viscosity = 0.5 to 1.2, Na+ molarity = 0 to 2.9.	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Quantified, but not specifically modeled.	These are not flowsheet limits, just physical properties of the stream.
	Interface 61b – Wastewater from WTP LAW Facility to WTP Balance of Facilities						
61b-1	TBD						
	Interface 62a – Utilities from WTP Balance of Facilities to WTP HLW Facility						
62a-1	Water from Balance of Facilities to HLW Facility (Stream HOP08-1, HOP08-2 in PIBOD): slurry density = 62.4 to 62.5 lb/ft^3, liquid density = n/a, viscosity = 0.9 cP, Na+ molarity = 0	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Quantified, but not specifically modeled.	These are not flowsheet limits, just physical properties of the stream.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
62a-2	Demineralized water from Balance of Facilities to HLW Facility (Stream HDH03, HDH13, HOP14-1P, HOP14-1S, HOP14-2P, HOP14-2S, HOP36-1, HOP36-2 in PIBOD): slurry density = 62.4 to 62.5 lb/ft^3, liquid density = 62.2 to 62.3 lb/ft^3, viscosity = 0.9 cP, Na+ molarity = 0	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Quantified, but not specifically modeled.	These are not flowsheet limits, just physical properties of the stream.
62a-3	NaOH from Balance of Facilities to HLW Facility (5 M concentration) (Stream HDH15, RLD68, RLD69 in PIBOD): slurry density = 74.39 lb/ft^3, liquid density = 74.39 lb/ft^3, viscosity = 3.0 cP, Na+ molarity = 4.9 to 5.0	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Quantified, but not specifically modeled.	These are not flowsheet limits, just physical properties of the stream.
62a-4	Ammonia from Balance of Facilities to HLW Facility (Stream HOP29-1, HOP29-2 in PIBOD): slurry density = 4.36E-02 lb/ft^3, liquid density = n/a, viscosity = 0.010 cP, Na+ molarity = n/a.	24590-WTP-DB-PET-09-001, *Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Not modeled.	These are not flowsheet limits, just physical properties of the stream.
62a-5	Blended glass formers from Balance of Facilities to HLW Facility (same as Stream HFP01-1 and HFP01-02 in PIBOD): slurry density = 125.0 to 143.0 lb/ft^3, liquid density = n/a, viscosity = 0.9 to 5.1, Na+ molarity = 0 to 6.8.	24590-WTP-DB-PET-09-001, *.Process Inputs Basis of Design (PIBOD)*		24590-WTP-M4C-V11T-00012, *Calculation of Process Stream Properties for the WTP*	Technical (calculated)	Quantified, but not specifically modeled.	These are not flowsheet limits, just physical properties of the stream.
	Interface 62b – Wastewater from WTP HLW Facility to WTP Balance of Facilities						
62b-1	TBD						
	Interface 63 – Wastewater from WTP Balance of Facilities to TEDF						
63-1	Continuous on-line monitoring for pH with limit is between 6.5 and 8.5.	HNF-SD-W049H-ICD-001, *200 Area Treated Effluent Disposal Facility Interface Control Document*	Not yet implemented.	ST 4500, *State Waste Discharge Permit Number ST 4500*	Operation	Not modeled.	Continuous on-line monitoring for pH is required. If on-line monitoring for pH is lost for greater than 24 hours, then daily pH grab samples will be taken, logged and reported to the ETF control room during transfers.
63-2	Continuous on-line flow rate monitoring with limit less than 500 gpm.	HNF-SD-W049H-ICD-001, *200 Area Treated Effluent Disposal Facility Interface Control Document*	Not yet implemented.	ST 4500, *State Waste Discharge Permit Number ST 4500*	Operation	Not modeled.	Continuous on-line monitoring is required. If flow monitoring is lost, WTP will notify the ETF control room when a transfer begins, estimated flow, and when the transfer ends.
63-3	Continuous on-line monitoring for conductivity is required.	HNF-SD-W049H-ICD-001, *200 Area Treated Effluent Disposal Facility Interface Control Document*	Not yet implemented.	ST 4500, *State Waste Discharge Permit Number ST 4500*	Operation	Not modeled.	Continuous on-line monitoring for conductivity is required. If on-line monitoring for conductivity is lost for greater than 24 hours, then daily conductivity grab

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
							samples will be taken, logged and reported to the ETF control room during transfers.
63-4	Meet the TEDF generating facilities sampling and analytical requirements as shown in Table 3 and Table 4 of HNF-SD-W049-ICD-001.	HNF-SD-W049H-ICD-001, *200 Area Treated Effluent Disposal Facility Interface Control Document*	Not yet implemented.	ST 4502, *State Waste Discharge Permit Number ST 4502*	Environmental	Not modeled.	
	Interface 64 – Wastewater from LERF/ETF to State-Approved Land Disposal Site						
64-1	Wastewater discharge from ETF to SALDS must meet the effluent limitations and ground water limitations listed in in Permit ST 4500. Concentrations must be below the action limits listed inETF-PRO-OP-51535 (see Attachment B-4):	HNF-3172, *Liquid Waste Processing Facilities Waste Acceptance Criteria*	ETF-PRO-OP-51535, “Verification System Operations”	ST 4500, *State Waste Discharge Permit Number ST 4500*	Environmental	The LERF/ETF is modeled as a simple splitter. The ETF splits are applied (SVF-1778), which partition the feed into solid and treated liquid waste. Overall partitioning of feed into solid waste and treated effluent is approximated using overall removal efficiencies for the reverse osmosis and ion exchange units (the polisher outlet). The values used are reported in HNF-4573, *Liquid Effluent Retention Facility Basin 44 Process Test Post-Report*, Appendix A. The liquid portion accumulates in the ETF-Liquid-Effluent tank. The SALDS will not be modeled explicitly; however, the demand on the SALDS from ETF can be estimated.	
64-2	ETF is required to monitor a list of constituents in the effluent stream to SALDS to provide an early warning that ground water limitations are being approached in the effluent. Exceedance of an early warning value requires the ETF to submit an early warning report, in writing, to Ecology within 10 calendar days from the detection of a contaminant in the effluent that exceeds an early warning value. Constituents that required monitoring and early warning values are listed in ST 4500.	ST 4500, *State Waste Discharge Permit Number ST 4500*	Quarterly Discharge Monitoring Report (DMR) to State	ST 4500, *State Waste Discharge Permit Number ST 4500*	Environmental	Not modeled.	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
64-3	Discharge flow rate to the SALDS must be between 150 300 gpm. The maximum daily flow allowed is 670,000 gal/day and the maximum average monthly discharge flow is 250,000 gal/day.	ETF-PRO-OP-51535, *Verification System Operations* ST 4502, *State Waste Discharge Permit Number ST 4502*	ETF-PRO-OP-51535, “Verification System Operations”	SALDS design	Operation	The LERF/ETF is modeled as a simple splitter. The ETF splits are applied (SVF-1778), which partition the feed into solid and treated liquid waste. Overall partitioning of feed into solid waste and treated effluent is approximated using overall removal efficiencies for the reverse osmosis and ion exchange units (the polisher outlet). The values used are reported in HNF-4573, *Liquid Effluent Retention Facility Basin 44 Process Test Post-Report*, Appendix A. The liquid portion accumulates in the ETF-Liquid-Effluent tank. The SALDS will not be modeled explicitly; however, the demand on the SALDS from ETF can be estimated.	SALDS was designed to allow the contents of one verification tank (ETF’s treated water tank prior to SALDS, capacity up to 670,000 gallons) to be discharged at 300 gpm into an empty drain field without flooding. Once filled, the SALDS should take about 36 hours to empty.

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
64-4	Effluent must be in compliance with the Final Delisting levels both inorganic and organic constituents listed in Table 2 of the EPA 40 CRF 261, Appendix IX. Delisting Levels: All total constituent concentrations in treated effluents managed under this exclusion must be equal to or less than the following levels, expressed as mg/L: Inorganic Constituents: Ammonia—6.0; Barium—1.6; Beryllium—4.5 × 10−2; Nickel—4.5 × 10−1; Silver—1.1 × 10−1; Vanadium—1.6 × 10−1; Zinc—6.8; Arsenic—1.5 × 10−2; Cadmium—1.1 × 10−2; Chromium—6.8 × 10−2; Lead—9.0 × 10−2; Mercury—6.8 × 10−3; Selenium—1.1 × 10−1; Fluoride—1.2; Cyanides—4.8 × 10−1 Organic Constituents: Cresol—1.2; 2,4,6 Trichlorophenol—3.6 × 10−1; Benzene—6.0 × 10−2; Chrysene—5.6 × 10−1; Hexachlorobenzne—2.0 × 10−3; Hexachlorocyclopentadiene—1.8 × 10−1; Dichloroisopropyl ether; [Bis(2-Chloroisopropyl) either]—6.0 × 10−2; Di-n-octylphthalate—4.8 × 10−1; 1-Butanol—2.4; Isophorone—4.2; Diphenylamine—5.6 × 10−1; p-Chloroaniline—1.2 × 10−1; Acetonitrile—1.2; Carbazole—1.8 × 10−1; N-Nitrosodimethylamine—2.0 × 10−2; Pyridine—2.4 × 10−2; Lindane [gamma-BHC]—3.0 × 10−3; Aroclor [total of Aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260]—5.0 × 10−4; Carbon tetrachloride—1.8 × 10−2; Tetrahydrofuran—5.6 × 10−1; Acetone—2.4; Carbon disulfide—2.3; Tributyl phosphate—1.2 × 10−1		None Found	40 CFR 261, "Identification and Listing of Hazardous Waste," Appendix IX, Table 2	Environmental	Not modeled.	
	Interface 65 – Solid Waste from LERF/ETF to Integrated Disposal Facility (IDF)	**Primary Stream: Secondary Waste**					
65-1	Same as 37-1 for Industrial Package 2 category packages.	RPP-RPT-50967, *Secondary Liquid Waste Treatment Project (T3W08) Conceptual Design Report*, Table 6-4	None	None	Environmental / safety	Not modeled	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
65-2	Transuranic content <100 nCi/g	RPP-8402, *Waste Acceptance Criteria for the Immobilized Low Activity Waste Disposal Facility*	None	None	Environmental / Safety	Not modeled	The source document is applicable only to Immobilized Low Activity Waste but appropriate elements are assumed applicable to RSW. No acceptance criteria currently exist for RSW disposal in the IDF. WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion*, Part III, Operating Unit Group 11, Integrated Disposal Facility, Permit Condition III.11.B.3: The scope of this Permit is restricted to the landfill construction and operation as necessary to dispose of: 1) immobilized low activity waste from the WTP, and 2) the Demonstration Bulk Vitrification System and IDF operational waste as identified in Chapter 4.0. Future expansion of the RCRA trench, or disposal of other wastes not specified in this Permit, is prohibited unless authorized via modification of this Permit.
65-3	Radionuclide concentration limits	RPP-8402, *Waste Acceptance Criteria for the Immobilized Low Activity Waste Disposal Facility*	None	10 CFR 61.55, "Waste Classification" DOE/ORP-2000-24, *Hanford Immobilized Low Activity Waste Performance Assessment: 2001 Version*	Environmental / safety	Not modeled	
65-4	Radionuclide release rate limits	RPP-8402, *Waste Acceptance Criteria for the Immobilized Low Activity Waste Disposal Facility*	None	DOE/ORP-2000-24, *Hanford Immobilized Low Activity Waste Performance Assessment: 2001 Version*	Environmental / safety	Not modeled	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
65-5	ETF unit operation decontamination factors.	HNF-4573, *Liquid Effluent Retention Facility Basin 44 Process Post-Report*, Appendix A	None	None	Technical (measured)	The LERF/ETF is modeled as a simple splitter. The ETF splits are applied (SVF-1778), which partition the feed into solid and treated liquid waste. Overall partitioning of feed into solid waste and treated effluent is approximated using overall removal efficiencies for the reverse osmosis and ion exchange units (the polisher outlet). A data logger is used to calculate the number of 55-gal solid waste drums produced each year.	
65-6	Cast stone formulation	RPP-RPT-50967, *Secondary Liquid Waste Treatment Project (T3W08) Conceptual Design Report*, Table 6-4	None	PNNL-20632, *Waste Acceptance Testing of Secondary Waste Forms: Cast Stone, Ceramicrete and DuraLith*	Technical (measured)	Not modeled.	
	Interface 66 – Site Utilities to SSTs						
66-1	To be addressed in a future revision						
	Interface 67 – Site Utilities to Central Waste Complex						
67-1	To be addressed in a future revision						
	Interface 68 – Site Utilities to Supp. TRU Treatment Facility						
68-1	To be addressed in a future revision						
	Interface 69 – Site Utilities to WRFs						
69-1	To be addressed in a future revision						
	Interface 70 – Site Utilities to DSTs						
70-1	To be addressed in a future revision						
	Interface 71 – Site Utilities to 222-S Lab						
71-1	To be addressed in a future revision						

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
	Interface 72 – Site Utilities to 242-A Evaporator						
72-1	(Paraphrased) The properties of the raw water stream to the 242-A Evaporator are: Temperature: 35-75 °F Average flow rate: 2,750 gpm Specific Gravity: 1.0	HNF-14755, *242-A Evaporator Documented Safety Analysis*, Table 2-1	HNF-4493, *Interface Control Document between Washington River Protection Solutions LLC (WRPS) the Tank Operations Contractor and the Mission Support Alliance, LLC (MSA) the Water Utilities Distribution System Manager*		Technical	Process water is modeled at 15 gal per 100 gal evaporated. A boil-off rate of 40 gpm is assumed. Condenser cooling water is not modeled.	
72-2	The projected raw water <u>normal</u> demands for the 242-A Evaporator are: Operation Mode: 2700 gpm Standby Mode: 10 gpm **Maximum: 2700 gpm** The projected raw water <u>peak</u> demands for the 242-A Evaporator are: Operation Mode: 3700 gpm Standby Mode: 500 gpm **Maximum: 3700 gpm**	HNF-4493, *Interface Control Document between Washington River Protection Solutions LLC (WRPS) the Tank Operations Contractor and the Mission Support Alliance, LLC (MSA) the Water Utilities Distribution System Manager*		HNF-SD-W049H-ICD-001, *200 Area Treated Effluent Disposal Facility Interface Control Document*	Technical	RPP-8402, *Waste Acceptance Criteria for the Immobilized Low Activity Waste Disposal Facility*	242-A peak raw water flow rate during evaporator campaigns is based on HNF-SD-W049H-ICD-001, normal demand during evaporator campaigns is approximately 2700 gpm at a Raw Water Pump discharge pressure of 110 psig to 125 psig. During standby operation, normal demand is ~10 gpm with peak demand estimated for vessel fill and flush operation and wash-downs.
72-3	Steam required for the evaporation process is supplied to the 242-A Building via a 12-in. steam line for 10lbf/in^2 gauge (low pressure) steam and a 6-in. steam line for the 90 lbf/in^2 gauge (medium pressure) steam from the 242A-BA boiler annex.	HNF-14755, *242-A Evaporator Documented Safety Analysis*, Page 2-105			Technical	RPP-8402, *Waste Acceptance Criteria for the Immobilized Low Activity Waste Disposal Facility*	
72-4	Maximum design saturated steam output for the medium pressure boiler is 5,520 lbs/hr and 38,640 lbs/hr for the low pressure boiler.	TOC-ICD-JCI-00030, *Interface Control Document Between Washington River Protection Solutions LLC (WRPS) and The Johnson Controls, Inc. (JCI) for Steam Delivery to the 242-A Evaporator*			Technical	RPP-8402, *Waste Acceptance Criteria for the Immobilized Low Activity Waste Disposal Facility*	
72-5	(Paraphrased) Up to 30,000 lbs/hr of combined steam supply for process/service needs is provided.	TOC-ICD-JCI-00030, *Interface Control Document Between Washington River Protection Solutions LLC and The Johnson Controls, Inc.(JCI) for Steam Delivery to the 242-A Evaporator*			Technical	RPP-8402, *Waste Acceptance Criteria for the Immobilized Low Activity Waste Disposal Facility*	

Table B-1. Interface Flow Parameters.

IFP No.	IFP Description	IFP Source Document	IFP Implementing Document	Basis Document	Technical Basis Category	HTWOS Model Simplification	Notes
72-6	Low pressure steam (10 psig) may not be supplied to the 242-A Evaporator via portable boilers.	TOC-ICD-JCI-00030, *Interface Control Document Between Washington River Protection Solutions LLC and The Johnson Controls, Inc. (JCI) for Steam Delivery to the 242-A Evaporator*			Technical	RPP-8402, *Waste Acceptance Criteria for the Immobilized Low Activity Waste Disposal Facility*	
	Interface 73 – Site Utilities to LAW PS						
73-1	To be addressed in a future revision						
	Interface 74 – Site Utilities to Tank Waste Characterization and Staging						
74-1	To be addressed in a future revision						
	Interface 75 – Site Utilities to WTP Balance of Facilities						
75-1	To be addressed in a future revision						
	Interface 76 – Site Utilities to SLAW Immobilization						
76-1	To be addressed in a future revision						
	Interface 77 – Site Utilities to LERF/ETF						
77-1	To be addressed in a future revision						
	Interface 78 – Off-gas from LERF/ETF to Stack						
78-1	To be addressed in a future revision						
	Interface 79 – Secondary Solid Waste from SLAW Immobilization to LDR Treatment						
79-1	Same as 37-1						
79-2	Same as 37-2						
79-3	Same as 37-3						
79-4	Same as 37-4						
	Interface 80 – Immobilized Secondary Solid Waste from LDR Treatment to IDF						
80-1	Same as 37-1						
80-2	Same as 65-2						
80-3	Same as 65-3						
80-4	Same as 65-4						

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WAC 173-303-640, "Tank Systems," *Washington Administrative Code*, as amended.

WAC 173-400, "General Regulations for Air Pollution Sources," *Washington Administrative Code*, as amended.

WAC 173-460, "Controls for New Sources of Toxic Air Pollutants," *Washington Administrative Code*, as amended.

WAC 246-247-030, "Definitions," *Washington Administrative Code*, as amended.

WAC 246-247-040, "General Standards," *Washington Administrative Code*, as amended.

WAC 246-247-060, "Applications, Registration and Licensing," *Washington Administrative Code*, as amended.

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WHC-SD-W252-ER-001, 1998, *Phase II Liquid Effluent Program (Project W-252) Wastewater Engineering Report and BAT/AKART Studies*, Rev. 0B, B&W Hanford Company, Richland, Washington.

WHC-SD-WM-ES-380, 1996, *Organic Emission Calculations for the 242-A Evaporator Vessel Vent System*, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-WM-PE-054, 1995, *242-A Campaign 94-2 Post Run Document*, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

WRPS-1204907, 2012, "Criticality Safety Determination Regarding Activities Resulting in Low pH Material Addition to a Tank," (WRPS internal letter from E. N. Dodd to D. M. Cato, November 8), Washington River Protection Solutions LLC, Richland, Washington.

B2.0 Attachments

Attachment B-1. IFP 37-2 Criteria.

Wastes Accepted By
DSSI Facility for Storage & Treatment

The following wastes are accepted by the DSSI facility for storage and treatment. Acceptance is subject to assigned RCRA codes, activity, and physical/chemical properties of the waste. A Generator Waste Profile Sheet is required for each unique waste type or form. Waste containments may be lab-pack, over-pack, bulk (e.g. drum, tote) or tanker.

RCRA Characteristic & Toxic Mixed Wastes:

- Ignitable
  High Total Organic Content (TOC) flammable & combustible liquids/semi-solids
  Combustible high TOC solid and semi-solid matrix wastes including: DVB & phenolic resins, spent activated carbon, and sludge/slurry wastes.
  Certain liquids containing or regulated as oxidizers
  Aqueous listed (e.g. derived-from) wastes containing RCRA constituents below treatment standards
- Corrosive
  Corrosive (acidic and basic) liquid wastes
  Corrosive solid wastes that can be
- Reactive
  Liquid wastes containing regulated levels of total cyanides or sulfides
- Toxic
  Most all D, F, P, & U listed liquid wastes that contain greater than 1% TOC content.
  RCRA specified CMBST or INCIN waste treatment technology
- "On-Specification" & "Off-Specification" Used Oils (40 CFR 279)
  Used lubricating/hydraulic/coolant fluids that may contain halogens and/or metal compounds

Low-Level Radioactive Wastes (i.e. non-RCRA regulated):

- Organic Liquids including:
  Scintillation fluids, antifreeze, non-hazardous solvents and mixtures & non-RCRA regulated oils
- Aqueous liquids including:
  Wash/rinse waters, laboratory and research generated fluids

TSCA Wastes:

- TSCA regulated PCB wastes including:
  PCB liquids/multi-phasic; regulated decontamination, remediation, and R&D/Laboratory

Waste Acceptance Radiological Limits

- Authorized to receive up to 20,000 curies Tritium and 300 curies Carbon-14.
- Licensed to receive 20 curies of radionuclides with atomic numbers 1 through 83; except Tritium and Carbon-14.
- Licensed to receive 10 curies of radionuclides with atomic number 84 though 92 (except Special Nuclear Material).
- License limit is 100 mCi for transuranics (expect Special Nuclear Material); concentration is not limited.
- Special Nuclear Material is limited to a unity fraction of <1; Uranium 233 limit is 175 grams; Uranium 235 limit is 350 grams; and total Plutonium limit is 200 grams.
- Limit for Source Material is 3000 kg.

Attachment B-2. IFP 37-3 Criteria.

PermaFix®
Northwest, Inc.

LOW-LEVEL RADIOACTIVE WASTE
WASTE ACCEPTANCE GUIDELINES

Prepared By:

12-4-07
Larry Morin, LL Materials Control

Approved By:

12-4-07
Mike McCargar, Work Control Supervisor

For: Perma-Fix Northwest Richland, Inc.
December 2007

Revision 04
12/07

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1.0 PFNW WASTE PROCESSING

1.1 PFNW accepts non-RCRA, low level, radioactive waste and materials for either non-thermal or thermal processing. PFNW also accepts mixed radioactive and hazardous wastes in Richland, Washington. Refer to the Mixed Hazardous Waste Acceptance Criteria for shipments of mixed waste.

1.2 By license, no wastes will be accepted by PFNW unless a properly executed contract or purchase order is on file, with an incorporated 'Return of Waste' clause such as indicated below:

1.3 With regards to the below clause, "Company" shall be the generator of the waste or company authorized by its license to receive the returned waste.

Return of Waste – Company understands and acknowledges that PFNW must, in accordance with its Radioactive Materials License, retain the right to return Radioactive Waste, whether processed or unprocessed, to the generator; provided, however, that a) any such return of Company waste that otherwise meets the PFNW Waste Acceptance Guidelines will occur only in the event the State exercises its regulatory authority under PFNW' Radioactive Material License, which requires such return, or b) any such return of Non-Conforming Company waste may be accomplished without regard to any such exercise of regulatory authority. Therefore, Company hereby represents, warrants, and promises that it has the legal right and ability to accept, and will accept, the return of radioactive waste, whether processed or unprocessed, back to the generating facility, in the event the exercise of regulatory authority by the State requires such return or in the event PFNW exercises its right to return non-conforming waste. In addition, Company represents, warrants, and promises a) the generating facility is located in a State or Compact that is a signatory to the Interregional Access Agreement for Waste Management, or b) that Company has written assurances from the appropriate State Governor's Office, State Radiation Control Program and Compact Official, if any, for such return of Company waste to be shipped to PFNW under this order.

______________________________ ______________
'Company' Representative Date

1.2 <u>Non-thermal processing includes</u>:

Pass Through (handling only)

Storage for Decay

Super Compaction

Volume Reduction (Segregation, sorting)

Stabilization/Encapsulation (e.g., sources)

Decontamination (e.g., metals, concrete)

Storage

Metal Recycling

Survey for Release (metals, concrete, etc.,)

Other processes as may be developed or requested from time to time

1.3 Thermal processing at PFNW includes:

Batch Processing Units 1 and 2

Other thermal processes as may be developed or requested from time to time

2.0 WASTE NOT ACCEPTED BY PFNW

The following types of waste are currently not accepted by PFNW:

Gases (except gas, not exceeding an internal pressure of 1.5 atm, contained in or on instruments or other equipment).

Pyrophoric Metals (except with special approval)

Explosives

Listed Dioxins

3.0 WASTE ACCEPTANCE GUIDELINES FOR NON-THERMALLY PROCESSED WASTE - (See Section 1.2)

In accordance with 10 CFR 30, licensees are required to verify the consignee's ability to receive radioactive materials. Contact Document Control at 509-375-5160 or 7014 for updated copies of the PFNW Low-Level Radioactive Materials License.

3.1. Activity Limits Per Shipment For Non-Thermally Processed Waste

Shipments to PFNW will require prior approval of the Operations Department. The activity being shipped will be compared to both site possession limits (as stated in the current site radioactive materials license) and the pertinent air permit. Every effort will be made to accommodate the requested shipment.

Activity limits in stated licenses and permits may at times be exceeded upon prior notification to PFNW and subsequent approval by the appropriate State Regulatory Agency. Contact the Operations Department in these situations for approvals. License and permit variances typically take 30 days for processing and approval so timely notification is necessary to minimize shipment delays.

3.1.1 Activity conditions applicable to Atomic Numbers 84-103 are:

3.1.1.1 For any container in which the diffuse waste acticity is greater than 10 mCi, PFNW will institute PFNW Low-Level Operating Procedure 104, Non-Routine Operational Planning.

3.1.1.2 For any container in which the diffuse waste container is greater than 100 mCi, requires State Regulatory Agency approval prior to receipt of the waste.

3.1.1.3 For any container in which the discrete source (sealed or otherwise) is greater than 10 mCi requires State Regulatory Agency approval prior to receipt.

3.2 Waste Forms And Restrictions For Non-Thermally Processed Waste

3.2.1 Non-Thermally Processed Dry Active Waste (DAW)

DAW consists of plastics, paper, glass, wood, cloth, light gauge metals, air filters, and other contaminated materials determined to be DAW by PFNW.

DAW shipped for supercompaction prior to disposal should be packaged in standard 55-gallon drums no taller than 35 1/4 inches. DAW may also be received for supercompaction in bulk containers (i.e., B-25 boxes, Sea/land containers, overpack drums, etc.,).

DAW sent for volume reduction prior to super compaction should be placed in transparent sealed plastic bags (55 gallon or less) inside the shipping container. Warning note(s) on the container must be provided if the material consists of sharps or other materials for which handling may present health and safety issues.

Prior approval from PFNW must be made if removable contamination levels exist on the outside of plastic bags in excess of 10,000 dpm/100 cm^2 beta-gamma and/or 1,000 dpm/100 cm^2 alpha. Additional charges may be incurred.

DAW for volume reduction and metal for decontamination, when sent in the same package, is acceptable only if both waste types net weight and radionuclide distribution are documented separately on the manifest or RSR.

DAW must be packaged for transport in accordance with the requirements cited in Section 8, paragraph c. DAW destined for pass through must be classified for disposal in accordance with the requirements cited in Section 8, paragraphs d, e, f or g, as appropriate.

DAW for thermal processing has additional restrictions (See Section 4.2.1)

3.2.2 Metals/Concrete for Decontamination/Recycling

Metal/concrete may be acceptable for decontamination dependent on isotopes of concern and provided it has no pyrophoric properties and the level of removable contamination is less than 10,000 dpm/100 cm^2 beta-gamma and 1,000 dpm/100 cm^2 alpha. Removable contamination levels in excess of these limits must have prior approval from PFNW. Additional charges may be incurred.

Verification must be provided that the metal/concrete has not been in a neutron field and is not activated.

3.2.3 Sealed Sources and Other Discrete Sources

Sealed sources or other discrete sources sent for stabilization or encapsulation shall be documented individually on the manifest. If special pricing has been quoted, that quote must be referenced on the PFNW Pre-Shipment Notification Form or otherwise forwarded with the shipment.

Sealed sources may qualify for thermal treatment and disposal as dry active waste provided the individual source is:

3.2.3.1 liquid, or
3.2.3.2 has a melting point below 1800°F, or
3.2.3.3 is in the form of a coating on the external surface only of a solid material.

For any container in which the discrete source (sealed or otherwise) is greater than 10 mCi, State Regulatory Agency approval is required prior to receipt.

Activity restrictions may apply.

3.2.4 Absorbed and Free Liquids

Liquids that have been absorbed shall be packaged in accordance with the applicable disposal site requirements or designated for thermal processing. If designated for thermal processing, organic absorbents are preferred over inorganic. (See Section 8, paragraph e). It is even more preferable that liquids not be absorbed and solids content is less than 5% by volume.

Free liquids sent for processing must have secondary containment or be packaged with an approved sorbent placed in the void space between the inner and outer container. The sorbent must be of sufficient volume to absorb all the liquid.

The volume of liquid present must be noted on the manifest. Special arrangements must be made for PFNW to receive liquids in a manner other than listed above.

3.2.5 Solidified Liquid

Solidified liquids are acceptable provided that they have been solidified and packaged in accordance with applicable disposal criteria (see Section 8, paragraphs e, f and g). Other packaging methods may be acceptable with prior approval of PFNW.

3.2.6 Radioactively Contaminated Asbestos

Radioactive, asbestos-containing material is acceptable provided it has been treated (abated) in accordance with 40 CFR 61.150

3.2.7 Radioactive Gases Contained in Instruments/Devices

Gases, not exceeding an internal pressure of 1.5 atm, that are an integral part of instruments and devices are acceptable. The devices must be packaged in accordance with the requirements cited in Section 8, paragraphs e and f.

3.2.8 Non-Thermally Processed Biological/Animal Waste

All biological and animal waste sent for non-thermal processing must be packaged in accordance with the disposal site requirements (see Section 8, paragraphs e and f).

3.2.9 Storage for decay materials containing short-lived radionuclides may be acceptable for storage for decay. Storage by license is limited to isotopes with 170-day T1/2 or less.

Radionuclides with T1/2, not exceeding 60 days, are limited to 25 curies per incoming package, without special approval.

S35 may not exceed 460 mCi per incoming package without special approval.

Ca45 may not exceed 2 mCi per incoming package without special approval.

All other radionuclides with T1/2 exceeding 60 days will require special approval.

Single containers with radionuclides that will not decay to <4.2 mCi and 1% of the original incoming activity, in that 5-year period, will not be acceptable for storage for decay.

4.0 WASTE ACCEPTANCE GUIDELINES FOR THERMAL PROCESS WASTE (See Section 1.3)

In accordance with 10 CFR 30, licensees are required to verify the consignee's ability to receive radioactive materials. Contact Document control at 509-375-5160 for updated copies of the PFNW Low-Level Radioactive Materials License.

4.1 Activity Limits For Thermal Process Waste

Shipments to PFNW will require prior approval of the Operations Department. The activity being shipped will be compared to both site possession limits (as stated in the current site radioactive materials license) and the thermal air permit. Every effort will be made to accommodate the requested shipment.

Activity limits in stated licenses and permits may at times be exceeded upon prior notification to PFNW and subsequent approval by the appropriate State Regulatory Agency. Contact the Materials Control Department in these situations for approvals. License and permit variances typically take 30 working days for processing and approval so timely notification is necessary to minimize shipment delays.

4.1.1 Activity conditions applicable to Atomic Numbers 84-103 are:

4.1.1.1 For any container in which the diffuse waste acticity is greater than 10 mCi, PFNW will institute PFNW Low-Level Operating Procedure 104, Non-Routine Operational Planning.

4.1.1.2 For any container in which the diffuse waste container is greater than 100 mCi, requires State Regulatory Agency approval prior to receipt of the waste.

4.1.1.3 For any container in which the discrete source (sealed or otherwise) is greater than 10 mCi requires State Regulatory Agency approval prior to receipt.

4.2 Waste Forms And Restrictions For Thermal Waste

4.2.1 Thermal Process Dry Active Waste (DAW)

Thermal process DAW may consist of the following materials in any combination:

Asbestos – in accordance with 40 CFR 61.150
100% cotton material
Cotton/polyester cloth
Diatomaceous earth
Glass
Granular activated carbon
High density polyethylene (HDPE)
Ion exchange resin
Latex
Leather
Nitrile/nitrile rubber
Nylon
Paper
Polycarbonate
Polyester
Polyethylene/polypropylene/polystyrene/
polyurethane/urethane plastics
< 5% by weight of polyvinyl chloride (PVC)
Natural rubber
Spun bonded polyolefin
Transparent thermoplastic
Ultra high molecular polyethylene
Wood
Sludges, Soil, and silica based inorganic materials
Organic absorbents (cellulose based)
Other materials certified incinerable

Materials with high percentages of inorganic matter will result in significantly less volume reduction and may be charged at a higher rate.

NOTE: Due to the varied physical characteristics of materials thermally processed, 100% removal of volatile radionuclides (H_3, C_4, I, Cl_{36}, S-35, and noble gases) may not be possible.

Materials strictly prohibited in thermal process DAW include:

> 5% wt PVC

Metals/Sharps (acceptable for BPU only with prior approval and special container marking to protect waste handlers)

Teflon and Fluorinated Products in ANY form

Any halogen-containing compounds will require special approval.

Sealed Sources (may be accepted on an individual basis with prior approval with a special pricing quote). Sealed sources may qualify for thermal treatment and disposal as dry active waste provided the individual source is:

A. liquid, or
B. has a melting point below 1800°F, or
C. is in the form of a coating on the external surface only of a solid material.

Activity restrictions may apply.

Salts (i.e., sodium chloride, sodium sulfates, phosphates, etc.) must be identified and will require special approval.

Pressurized containers, such as spray cans.

4.2.2 Resins

Resins are generally not accepted for thermal treatment at this time but may be considered on a case by case basis.

4.2.3 Biological Waste (Animal Carcasses, etc.)

Biological waste must be received frozen unless prior approval is given by PFNW.

Animal bedding materials are acceptable.

Vegetation samples are acceptable.

Any DAW acceptable for thermal processing (see Section 4.2.1) that is contaminated with biological material is acceptable. Wastes must not contain material specifically prohibited by Section 4.2.1. Materials listed with limitations in Section 4.2.1 will require special approval.

4.2.4 Aqueous Liquid Waste

Aqueous liquid waste may be received in steel or polyethylene drums, liners, or other like containers, polyethylene carboys, prior approved bulk tanks, or in double wall containers (e.g., 30-gallon tight-head drum inside a 55-gallon open-top drum). If absorbent material is used, organic absorbents are preferred over inorganic sorbents.

Aqueous liquids sent for thermal processing must meet the following guidelines:

<30% by weight chelating agents
<5% by weight oil content

pH range from 2 to 12.5

<5% by volume total bulk solids
<0.1% total metals

Aqueous liquids exceeding the above limits may be accepted with prior notification and subsequent approval by PFNW.

Aqueous liquids containing RCRA/TSCA wastes or etiological agents are strictly prohibited.

Aqueous liquids must be free of items prohibited by Section 4.2.1. Materials listed with limitations in Section 4.2.1 will require special approval.

4.2.5 Oils (Petroleum-based products and synthetic fluids)

Waste oils may be received in steel or polyethylene drums, liners or other like containers, polyethylene carboys, prior approved bulk tanks, or in double wall containers (e.g., 30-gallon tight-head drum inside a 55-gallon open-top drum). If absorbent material is used, organic absorbents are preferred over inorganic sorbents.

Waste oils must meet the following guidelines:

<5% by volume aqueous liquid content
>140°F flash point
<5% by weight total solids
Viscosity must be <90 weight oil (must be pumpable at 60°F).

Phosphate, silicon or other inorganic-based special oils or fluids (e.g., EHC, Fyrquel, etc.) shall be free from trash or other bulk solids. This material will require special pricing. These materials must also be uniquely identified on the manifest and the container(s). The resulting thermally processed volume is significantly higher for these fluids.

Different liquids should not be mixed. Mixed liquids (oil, water, inorganic based fluids, etc.) shall be identified with the approximately proportions by volume and may be priced at the cost of the most process restrictive product.

Waste oils containing RCRA/TSCA wastes are strictly prohibited.

Waste oils must be free of prohibited items listed in Section 4.2.1. Materials listed with limitations in Section 4.2.1 will require special approval.

4.2.6 Soils and Sludges

Soils and sludges not containing RCRA/TSCA wastes are acceptable.

Sludges must be pumpable/sprayable or dry/pneumatic conveyable.

Soils and sludges must be free of items prohibited by Section 4.2.1. Materials listed with limitations in Section 4.2.1 will require special approval.

4.2.7 Organic Liquid (non-water based)

Organic liquid not containing RCRA/TSCA wastes and that are doubly contained or packaged with an approved sorbent placed in the void space between the inner and outer container are acceptable. The sorbent must be of sufficient volume to absorb all the liquid. The volume of liquid present must be noted on the manifest or RSR.

Organic liquids shall be free from trash or other bulk solids, as well as other materials prohibited by Section 4.2.1. Materials listed with limitations in Section 4.2.1 will require special approval.

5.0 ACCEPTANCE OF NON-STANDARD WASTE

PFNW may accept waste that does not meet the standard waste acceptance guidelines above. The client must work with the Customer Service Representative and the Marketing/Sales Representative to determine the necessary conditions for approval.

Non-standard wastes may require additional processing time and may fall out of process and/or disposal time contracted commitments. Synthetic fluids are an example of this type of waste.

The Customer Service Representative will work with the Radiation Safety Officer and the Plant Supervisors to determine the acceptability of the waste form. The following questions should be addressed:

Can the waste be processed in a timeframe that meets PFNW' license and permit conditions?

Can the waste be safely processed in the planned manner?

The Customer Service Representative then must obtain the approval of the LLW Facility Manager or his designee. The LLW Facility Manager will confirm that no license or permit requirement will be violated by accepting and processing the waste. Specifically, the LLW Facility Manager shall confirm that:

The waste can be safely shipped, received, and adequately processed for burial and has a return of waste clause.

The radionuclide concentrations can be accepted without exceeding PFNW' license/permit limitations.

The waste can be processed in a manner that meets PFNW' ALARA and Health & Safety program objectives, and managed in an environmentally safe manner.

The LLW Facility Manager will work with the Marketing/Sales Representative and the customer to complete a Pre-Shipment Notification Form. A copy of the completed form shall be provided to the PFNW LLW Facility Manager. Customers may not ship waste to PFNW without an PFNW-assigned shipment approval number. This number will appear in the upper right-hand corner of the Pre-Shipment Notification Form.

Pricing for non-standard waste shall be developed by the Chief Operating Officer with the assistance of the appropriate supervisors/managers.

6.0 PACKAGING AND SHIPPING GUIDELINES

6.1 Container Guidelines

Package identifications and other required markings and labeling shall be clearly visible on the shipping containers.

Radioactive waste/materials shall be packaged in wooden or steel containers unless alternative containers are approved by PFNW.

Combustible-type containers, such as fiber boxes or drums, are preferable for wastes to be thermally treated.

Wooden boxes shall be banded and secure.

Steel boxes, as shipping containers, shall have all retaining clips in place and secure.

Drum rings and bolts shall be secured properly. Locking nuts, when present, shall be secure.

Containers exceeding 1000 pounds must be palletized or fitted with lift rigging.

If inner containers exceed removable contamination levels in excess of 1000 dpm/100 cm^2 beta/gamma or 20 dpm/100 cm^2 alpha, PFNW may request extended use of the external containers until the inner containers can be safely off-loaded. Costs for holding external containers will be negotiated by PFNW Marketing/Sales personnel.

6.2 Volume Measurement and Tare Weights

Volume shall be based on the external dimensions of the container excluding the dunnage.

Pass-through waste shipped for inspection only shall have the volume documented in accordance with the appropriate disposal facility criteria.

Tare weights shall be marked on each package greater than 20 ft^3 or weights shall be provided in an attachment to the shipping documents. PFNW may weigh each item upon receipt for verification.

In all cases, the quantity of waste, gross or net as appropriate, associated with a contracted billing category should be provided either on or with the manifest.

6.3 Shipment Guidelines

The PFNW Operations Department must be informed of all waste shipments to PFNW regardless of the carrier. This provides the Richland site a concise schedule of shipments to be received and will facilitate timely off-loading.

All waste shippers shall submit the PFNW Pre-Shipment Notification Form (Attachment 2) prior to shipment. Approval to ship waste must be received by the shipper 24 hours prior to shipment. Waste may not be shipped to PFNW without an PFNW-assigned approval number. This number will appear in the upper right-hand corner of the PFNW Pre-Shipment Notification Form.

Drums must be loaded so that they can be off-loaded using a mechanical lifter. Drums weighting >2,500 pounds will be accepted with prior approval of the PFNW Operations Department. PFNW prefers all drums be palletized.

Drums may be double-stacked, provided that no drums heavier than 400 pounds are placed on top.

Containers other than those noted above shall be elevated from the trailer floor and accessible with a forklift.

Each package shall have a top clearance of at least 18 inches in a closed van.

Packages or palletized loads weighing more than 4,200 pounds shall not be shipped in a closed, hardtop trailer.

Liners, boxes and/or palletized drums shipped on flatbed trailers must be loaded in such a manner that they may be off-loaded from the side using a forklift.

Items heavier than 12,500 pounds must have at least 6 inches of bottom clearance, or be accessible from the top with approved lifting mechanisms.

PFNW accepts radioactive waste/material shipments by highway and with special approval by rail, vessel, or air. Contact the PFNW LLW Facility Manager to arrange for receipt by other than highway.

All shipments shall meet all the applicable requirements cited in Section 8.

6.4 Empty Package Return and Container Leasing

Packaging shall not be returned unless prior arrangements have been made.

PFNW can provide boxes, sea/land containers, and drums, by arranging with the PFNW LLW Facility Manager.

Sea/land containers and metal boxes (when available) can be provided to customers as necessary.

7.0 NOTIFICATION, MANIFESTING AND DOCUMENTATION GUIDELINES

7.1 General Procedure For Waste Shipments to PFNW

1. Customer establishes contract with PFNW Sales and Marketing.

NOTE: In accordance with Condition 28 of PFNW' License #WN-I0393-1, the licensee shall establish in every contractual obligation relating to radioactive materials the ability to return radioactive material, processed or unprocessed, to the prior licensed possessor.

2. Customer completes Pre-Shipment Notification Form (Attachment 2) and faxes or e-mails notification to PFNW Operations Department within 24 hours of the anticipated shipment.

   Fax: 509-371-1040
   e-mail: mmccargar@perma-fix.com
   lmorin@perma-fix.com

3. Customer may arrange transportation either through the PFNW Operations or, if arranging own transportation, must notify PFNW Operations of the pending shipment. This allows for development of a comprehensive schedule of shipments within the PFNW system to ensure all of our customer needs are met in a timely manner. Operations may be reached at 509-375-7046 or 5160.

4. PFNW reviews Pre-Shipment Notification Form and anticipated waste shipment for compliance with these Guidelines, Site License and Permits, and Customer Contract.

5. If not approved, the Customer Service Manager will be contacted for resolution.

6. If approved, an acceptance number will be assigned to the shipment and either faxed or e-mailed back to the customer.

7. The customer then ships the waste to PFNW. Scheduling changes must be relayed to the PFNW Operations Department.

8. When the shipment arrives, the shipment and all supporting documentation will be reviewed for compliance with all applicable permits, licenses, regulations and contract conditions. Any discrepancies must be resolved prior to shipment acceptance. Conditions that cannot be resolved may result in rejection and return of the shipment to the generator.

NOTE: All shipments are subject to the review and approval of the Washington Department of Health.

7.2 Shipment Documents

The following documents shall accompany each shipment of radioactive waste/material to PFNW:

Uniform Low-Level Radioactive Waste Manifest (no exceptions per PFNW Radioactive Materials License). Original signatures are required.

NOTE: To aid in electronic transfer of data, PFNW strongly encourages the use of the low-track electronic manifest (available at http://mims.inel.gov/web/owa/Ltindex. Other electronically-generated manifests, such as Radman or DWJames, are also acceptable. Use of handwritten manifests may cause delays in off-loading.

Original Washington Department of Health (WDOH) Form RHF-31 (no exceptions per PFNW Radioactive Materials License). Original signatures are required on RHF-31 Form.

A statement of any unusual hazards or conditions

DOE/NRC Form 741 for SNM, if applicable

Emergency contact information

Exclusive Use Instructions, if applicable

Exceptions Taken (e.g., limited quantity, etc.)

7.3 Manifesting Requirements

Manifest forms shall comply with current Department of Transportation (DOT) and NRC regulations. Original signatures are require don the manifest received at PFNW.

Manifest forms are to be inspected by PFNW and made available to a WDOH official prior to acceptance.

Improperly prepared Manifest forms will result in acceptance delays or shipment refusals.

Notification of receipt, by return of a signed copy of the Manifest Form 540 shall be made to the customer within 7 days. Discrepancies are to be noted on the manifest, or a cover letter. PFNW will typically also fax a copy to the shipper upon receipt.

All totals on the Manifest shall match all totals on the accompanying paperwork for each shipment.

All volumes, weights, and activities should be a reasonable estimate. Gross and net weight and volume for each container in the shipment must be provided to PFNW with the shipment.

If the customer is sending materials in different billing categories in the same shipment, an appropriate measurement of each waste category should be provided to aid in timely and accurate billing.

If shielded containers are being used, it is extremely important to provide PFNW with the net weights of the waste to be processed.

Use Manifest continuation sheets, as necessary, to fully describe each waste form within each package.

The radionuclides present in each waste form are to be listed.

De-listing of trace or insignificant radionuclides, as allowed by current DOT regulations or Burial Site Guidelines, is encouraged. Waste manifests for materials shipped to PFNW for processing that contains radionuclides not listed on Energy Solutions' current radioactive materials license will not be processed for disposal at Energy Solutions.

The milliCurie content of each radionuclide for each waste form is to be provided.

Indicate the physical form of each waste type.

Indicate the chemical form of each waste type.

If the waste form contains chelating agents in quantities greater than 0.1%, the types and their weight percentages are to be listed.

Each waste form is to be described. Different waste forms within a package require a separate radionuclide/activity breakdown on the manifest or attachment. For example, if oil for thermal and DAW for decay are manifested in a single shipping package, a separate radionuclide breakdown for each should be provided to ensure proper tracking of the waste.

If SNM is present in the waste form, the gram weight is to be provided.

If source material is present in the waste form, the source kilograms are to be provided.

The total weight of each package and its contents is to be provided. If this is an estimate, it should be so stated.

The volume for each waste form, either in cubic feet or cubic meters, is to be provided.

The type of container used for each package is to be listed.

Unique identification numbers shall be provided for each container.

The highest measured radiation level for each package surface and T.I., when applicable, is to be recorded.

The type of DOT labels or markings used on each containers are to be recorded.

Containers of biological materials requiring refrigeration must be separately identified on documents forwarded with the shipment.

In accordance with the PFNW Radioactive Materials License, each shipment must be accompanied by a Washington State Form RHF-31 (Attachment 1). Original signatures are required.

7.4 Classification Requirements

Although the generator is not required to classify waste/material that is sent to PFNW for processing, in accordance with 10 CFR 20 Appendix G, special arrangements must be made prior to receipt of unprocessed (Class A stable, B, or C) wastes. This will ensure the customer wastes can be processed in full compliance with disposal site and NRC guidance.

All waste received at PFNW for pass-through prior to disposal shall be classified in accordance with 10 CFR 61.55 and the designated disposal site requirements.

The classification of each waste form, either AU, AS, B, or C is to be listed.

For Class C wastes, specific justification for the classification, which details methods and calculations, must be presented to PFNW prior to shipment.

Absorbed and solidified liquids shall be classified over the pre-absorbed/solidified volume.

Sources (sealed sources and discrete items) designated for disposal shall be classified in accordance with the appropriate disposal facility guidelines.

For Barnwell, South Carolina, classify over the volume of the source.

For U.S. Ecology, if the source is <100 microCuries, classify over the volume of the packaging. For sources >100 microCuries, classify over the volume of the source, or if encapsulated, over the volume of the packaging.

NOTE: Sealed sources are prohibited for disposal at Energy Solutions.

8.0 REFERENCED REQUIREMENTS FOR ALL PFNW CUSTOMERS

All customers shipping radioactive waste to PFNW shall comply with the requirements contained in the following documents, as applicable:

a. PFNW, Washington, Department of Health Radioactive Materials License WN-10393-1

b. Washington Administrative Codes

c. U.S. Department of Transportation (DOT) Code of Federal Regulations (CFR) Title 49

d. U.S. Nuclear Regulatory Commission (NRC) CFR Title 10

e. U.S. Ecology Low-Level Radioactive Waste Disposal License

f. CNSI Barnwell Waste Management Facility site Disposal Criteria

g. Energy Solutions Site Acceptance Criteria

h. DOE-Hanford Waste Acceptance Criteria

i. NTS Waste Acceptance Criteria

9.0 PFNW GENERAL FACILITY INFORMATION

Address:	2025 Battelle Boulevard Richland, WA 99354
Telephone:	(509) 375-7066 (24 hours a day) (509) 375-7046
FAX:	(509) 371-1040 (24 hours a day)

Emergency: (509) 375-7066 or (800) 321-2844 (24 hours a day)

Normal Hours: Monday through Friday, 6:30 a.m. - 3:00 p.m. PST

Waste Operations and Receiving: Monday through Thursday, 6:30 a.m. – 5:00 p.m.

Shipments received Friday through Sunday may incur additional charges

Observed Company Holidays:

Memorial Day Observance
Independence Day
Labor Day
Thanksgiving and the following Friday
Christmas and the day before or after
New Years Day

10.0 ATTACHMENTS

Attachment 1 – Washington State Form RHF-31D
Attachment 2 – Pre-Shipment Notification Form
Attachment 3 – Pre-Shipment Notification Form Instructions

RADIOACTIVE WASTE SHIPMENT CERTIFICATION FOR SHIPMENTS TO THE COMMERCIAL RADIOACTIVE WASTE DISPOSAL FACILITY OR RADIOACTIVE WASTE PROCESSOR

The following certification, completed as applicable, is made to the state of Washington:

Certification is hereby made to the state of Washington that the radioactive waste described on manifest/bill of lading No.__________ has been inspected and it has been determined that the materials are properly classified, described, packaged, marked, and labeled, and are in proper condition for transportation according to the applicable federal and state regulations, laws, rules, and licenses.

The undersigned shall indemnify and hold harmless the state of Washington from any and all claims, suits, losses, charges, and expenses on account of injuries to any and all persons whomsoever, and any and all property damage arising or growing out of or in any manner connected with this shipment to the extent that the claims, suits, losses, charges, or expenses are caused in whole or in part by negligent acts or omissions of the undersigned.[1]

Except for any violation of applicable state or federal statute or regulation or license condition respecting packaging and shipment, inspection and acceptance of any item or container or material covered by this certification by the state of Washington or a duly authorized contractor shall release the party who executed this certificate from any and all requirements of indemnification and hold harmless from injury or loss.

SECTION A:
GENERATOR: __________
(Company or Agency Name)
PERMIT NUMBER: __________
VOLUME OF WASTE IN THIS SHIPMENT: __________
BY: __________ (Printed Name) TITLE: __________
SIGNATURE: __________ DATED: __________

SECTION B:
BROKER: __________
(Company Name)
PERMIT NUMBER: __________
VOLUME OF WASTE IN THIS SHIPMENT: __________
BY: __________ (Printed Name) TITLE: __________
SIGNATURE: __________ DATED: __________

SECTION C:
CARRIER: __________
(Company Name)
VOLUME OF WASTE IN THIS SHIPMENT: __________
BY: __________ (Printed Name) TITLE: __________
SIGNATURE: __________ DATED: __________

DOH RHF-31D
Updated 3/01

[1] Federal government generators are referred to the provisions of the Federal Tort Claims Act (28 U.S.C. §2671-2680).

Low Level Pre-Shipment Notification Form

PFNW

Signature		Shipment Approval Number	
PFNW Materials Control Manager or Designee	Date		
1. Broker/ Shipper		6. Broker/Shipper Telephone	
2. Client		6. Broker/Shipper FAX	
3. Carrier		7. Client Telephone	
4. Manifest Number		Client FAX	
5. Ship Date		8. Proper Shipping Name (Circle one or more)	
Scheduled Arrival Date		LSA I LSA II LSA III LTD QTY EMPTY	
9. Material Description		SCO I SCO II Type A I or A Non-DOT	

10. List All Isotopes and Total Activity of Each: (computer generated shipment summary sheet may be used)

Isotope	Activity		Isotope	Activity		Isotope	Activity	
		mCi			mCi			mCi
		mCi			mCi			mCi
		mCi			mCi			mCi
		mCi			mCi			mCi
		mCi			mCi			mCi
		mCi			mCi			mCi
		mCi			mCi			mCi
		mCi			mCi			mCi
		mCi			mCi	Total		mCi

11. Total SNM for Shipment gms		12. Total Source for Shipment kgs	
13. Shipment Net Volume ft3		14. Shipment Gross Weight lbs	

15. Container Type and Number: Metal drum C-van Metal box
Tanker Fiberbox Fiber Box Other:

16. Processing: (list quantities and units, based on contracted billing category, for each desired process)

Volume Reduction	Super Compaction	Stabilize	Fill Material	Pass Through	Store for Decay

Decon & Release	Safgias	Batch Processing Unit	Return Container #'s

17. Special processing or billing instructions

PFNW Waste Acceptance Guidelines
Attachment 2

Page 1 of 2

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18. Have you completed a Washington State RHF 31 D form ?	YES	NO
19. Are you exporting from the Rocky Mountain Compact ?	YES	NO
20. If block 19 is yes, do you have an export permit ?	YES	NO
21. Are you declaring any part of this waste to be NORM, NARM or exempt ?	YES	NA
22. If block 21 is yes, do you have a determination letter ?	YES	NO

23. End Disposition (circle one or more, if more than one specify in space provided below)

DOE Burial		LL Trench	ERDF
US Ecology		WA St. Site Use Permit #	US EcologyGenerator #
Barnwell		Access Fee Contract #	SC Transport Permit #
Envirocare		Southwest Commision Permit #	Central Interstate Commision Permit #
Thermal Destruction	(No disposal volume after processing)		
Free Release			
Return to Generator			

Notice: The material you are expecting to ship to Perma-Fix Northwest Richland, Richland WA, must enter the state at one of two entry points. The driver will be required to stop for an inspection of the vehicle to insure compliance with the State of Washington and Department of Transportation requirements for vehicles carrying hazardous materials. The transport vehicle will not be allowed entry into the state until the the vehicle passes this inspection. The shipment can not be accepted at PFNW without a certificate of inspection from one of these checkpoints:

1.) Weigh Station at Plymouth (I-82) Phone (509) 734-7043
2.) Weigh Station at Spokane (I-90) Phone (509) 226-3366

The driver must notify one of these checkpoints by phone 4 hours prior to entering the state. A personal monetary fine of $100 can be levied for failure to stop at one of the above checkpoints. A lengthy delay may also be expected in addition to the $100 fine. Please make all drivers aware of these requirements before leaving your facility.

24. I hereby certify this form is complete to the best of my knowledge.

Shipper Signature: Date:

Shipper Name (Print): Phone:

This form is to be completed and sent to Perma-Fix Northwest, Richland WA, at least 24 hours prior to departure of your shipment. If a shipment arrives without a shipment approval number it may result in excessive delays and demurrage charges or possible return of the shipment to the generator.

Instruction Sheet for Pre-Shipment Notification Form

The Pre-Shipment Notification Form provides Perma-Fix Northwest Richland, Inc. (PFNW) with the information needed to properly receive and process generators waste without costly time delays. It also allows PFNW to resolve any questions before waste arrives.

Data Entry Instructions

1. Enter the name of the company that is brokering the shipment or company shipping the load.
2. Enter the name of the facility that waste originated from.
3. Enter the name of the transporting company.
4. Enter the manifest number if known. If the manifest number is not available until the day of the shipment then leave blank.
5. Enter anticipated dates of shipment and arrival.
6. Enter the telephone number of the shipping or brokering company.
7. Enter the telephone number of the facility waste originated from.
8. Enter all DOT proper shipping classes that will be used for containers in this shipment. If a shipping class determination is not going to be done until the date of shipment, then leave blank.
9. Write a brief description of the material type in the shipment (e.g., 7 drums liquid glycol and water, 2 c-vans of compactable trash). The material described should match the contract category descriptions.
10. List all isotopes to be in the shipment and the totals of each for the shipment. This is vital in approving the shipment. These isotopes and activities will be checked against the current onsite inventory and PFNW' radioactive material license. A shipment summary sheet may be attached in lieu of completing this section.
11. Enter the total grams of SNM for the shipment.
12. Enter the total kilograms of source material for the shipment.
13. Enter the shipment net volume in cubic feet. If it is an estimate write "est." after the volume.
14. Enter the gross weight of the shipment in pounds. If it is an estimate write "est." after the weight.
15. Circle the container types that will be in the shipment or write in the type of container in the space marked "other" if it is not listed. Write the number of each type of container in the space next to the container type.
16. This block is used to describe the method of process the generator would like used for their material. List the quantity and units under the process to be used. The quantity used is to be based on the contracted billing category to allow for timely invoicing.
17. If there is a need to give specific instructions concerning the process of a container, write it in this block. Also reference any special billing agreement as applicable.
18. Circle the appropriate answer. The State of Washington requires an RHF-31 form for waste transported in the state and must be part of the shipping papers. Original signatures are required in all sections.
19. Circle the appropriate answer.
20. Circle the appropriate answer. An export permit must be in place before shipment can be made and a copy must be included with the shipping papers.
21. Circle the appropriate answer.
22. Circle the appropriate answer. A copy of the determination letter should accompany the shipment.
23. Circle the appropriate end disposition of the waste. If there is more than one, specify which waste goes where in the block pertaining to that disposition. In addition, if the waste end disposition is;
    a. DOE Burial at the Hanford Site, then specify if the generator is onsite or offsite.
    b. US Ecology, then include the Washington State Site Use Generator number and the US Ecology Generator number for the generator.
    c. Barnwell, then include the Access Fee Contract number and the South Carolina Transport Permit number for the generator.
24. This is to be signed by the party responsible for the shipment. They will be the first point of contact if there are any questions concerning the shipment.

After review of the Pre-Shipment Notification Form, a shipment approval number will be issued for that shipment. This number is entered on the top of the form and then the completed signed form sent with the shipment. PFNW requests that a copy of the finished manifest be faxed or e-mailed to the Richland facility the date of the shipment. This is not a requirement to acceptance, but expedites the offload of the shipment.

FAX: 509-371-1040 **EMAIL: mmccargar@perma-fix.com**
lmorln@perma-fix.com

NOTE: It is imperative that the shipper supply PFNW with all tare weights to containers that are not to be part of the waste stream.

PermaFix® Northwest, Inc.

WASTE ACCEPTANCE CRITERIA

MIXED WASTE OPERATIONS

Perma-Fix Northwest Richland, Inc. (PFNW)

Prepared By:

Chuck White, Technical Manager

Approved By:

Jamie Granger, Regulatory Compliance Officer

WASTE ACCEPTANCE CRITERIA

PFNW Mixed Waste Facility (MWF) can receive and manage mixed waste carrying a dangerous or hazardous waste code, except for mixed waste carrying the listed non-specific source waste codes F020 through F023 and F026 through F028. Typical waste types may include bulk solids (soil, gravel, granular solids, filter cake, tank heels, etc.), debris, bulk liquids (organic and inorganic), bulk metals (sheet metal, pipes, lead, etc.), and heterogeneous solids (personal protective equipment, spill clean up kits, etc.).

GENERAL OUTLINE FOR PRE-ACCEPTANCE AND WASTE RECEIPT

- PFNW reviews/approves waste profile record submitted by generator.
- Inform generator in writing that PFNW can receive the waste stream (e.g., approve the waste profile).
- In accordance with Permit Number WAR000010355 Permit Condition II.B.2 for out-of-state shipments, PFNW notifies the Washington State Department of Ecology (Ecology), in writing, at least four (4) weeks in advance of the date scheduled to receive the waste.
- Generator notifies PFNW of intent to ship mixed waste by providing anticipated volume of waste and anticipated shipping schedule.
- PFNW works with the generator to establish a tentative shipment schedule.
- PFNW reviews the final shipping papers to verify that the waste will be shipped in accordance with DOT regulations.
- PFNW realizes that many of its customers possess very small quantities of mixed wastes and may only have one shipment to make. Mixed waste acceptance may be significantly different and more difficult than low-level waste acceptance. PFNW has the personnel and experience to both guide you through the process and perform the service for you. Contact your Sales Manager should you need any assistance.

RESTRICTED WASTES

Certain waste cannot be stored and/or treated at the MWF. Table 1.0 identifies the waste restricted from the MWF.

Table 1.0
Waste Restricted from MWF[1]

Restricted Waste	Rationale
Forbidden explosives as defined by 49 CFR 173.51, or Class A explosives as defined by 49 CFR 173.53, or Class B explosives as defined by 49 CFR 173.88. (WAC 173-303-090(7)(a)(viii)).	No treatment capability for forbidden Class A or Class B explosives.
Waste carrying a waste code not listed in the Part A Application.	Regulatory Restriction
Waste classified as explosive or shock sensitive as defined by WAC 173-303-090(7)(a)(vii)-(viii)	No management capability for these waste types.
Waste classified as dioxin waste (F020-F023 and F026-F028).	Regulatory Restriction
Containers holding a containerized gas at pressures greater than 25 psi[2] or larger than 18"[2].	No treatment capability for containers of containerized gas above 25 psi[2] or larger than 18".
Waste that would cause the MWF to exceed the possession requirements listed in the MWF radioactive material license. (RML #WN-I0508-1)	MWF cannot exceed the possession limits stipulated in the MWF radioactive materials license.
Liquid waste received in greater than 55-gallon containers with a flash point less than 100°F.	No storage capability for these waste types.

[1]If it is determined that a waste listed on this table is received, the restricted waste may be stored separately in the waste storage building until arrangements are completed to return the waste to the generator or to forward the waste to a facility authorized and capable to receive the waste.

[2]These values are established from the manufacturer's specifications of the containerized gas treatment equipment.

ANALYTICAL AND WRITTEN INFORMATION

The following written and analytical information will be used to evaluate waste for management at the MWF:

- Pertinent chemical, radiological and physical data on the waste profile.
- A sample, if necessary. A sample may not be required by PFNW if: (1) the pre-acceptance documentation gives sufficient information to maintain compliance with the permit and operational constraints and (2) the submittal of a sample would not materially aid in the treatment decision process. If necessary, the sample may be obtained by PFNW on receipt of the initial shipment of the waste prior to formal acceptance (or re-evaluation of waste profile).
- Land Disposal Restriction (LDR) notification and certification information and/or data as required in Washington Administrative Code (WAC) 173-303-140 (40 CR 268.7), if applicable.
- Other supporting documentation such as Material Safety Data Sheets (MSDS) and product ingredients, when appropriate.

The waste profile record identifies the minimum informational requirements that must be supplied for PFNW to properly evaluate the waste stream and approve the waste profile. PFNW may request additional information not included on the waste profile record.

Waste Profile forms and other required forms may be found at our website at www.perma-fix.com.

DECISION EVALUATION LOGIC

PFNW may require additional parameter analyses to screen sample contaminants and/or properties, based on the following:

- Waste profile record description of the wastes' chemical, radiological and physical properties.
- Waste profile record description of the process generating the waste.
- Any additional documentation, including information that the waste is subject to LDR of 40 CFR Part 268 or WAC 173-303-140.
- Results of any parameter analyses.

- Experience and judgment of PFNW management.

The pre-acceptance evaluation concludes with documenting whether the waste is accepted and the proposed method of management. Acceptance decisions are based on:

- Conditions or limitations of existing licenses, permits and regulations.
- Capability to manage the waste in a safe and environmentally sound manner.
- Waste profile record description of the process generating the waste.
- Waste profile record description of the chemical and physical properties of the waste.
- Any additional documentation, including information that the waste is subject to LDR of 40 CFR Part 268 or WAC 173-303-140.
- Results of the parameter analyses.

A waste may be rejected during the pre-acceptance process for any of the following reasons:

- Significant discrepancy or discrepancies between pre-acceptance sample analysis results and analytical information provided by the generator.
- Incomplete or outdated information provided by the waste generator.
- The waste category is specifically excluded from acceptance at the MWF.
- The waste cannot be safely and/or effectively treated, processed, or stored at the MWF.
- There is no outlet for disposal.
- Radioactive License Condition (activity levels) will be exceeded, if received.

WASTE PROFILE RE-EVALUATION

PFNW will re-evaluate a waste profile if:

- The process generating the waste has changed or

- Inspection or analysis indicates that the waste received at the MWF does not match the waste identified on the accompanying manifest or shipping paper or pre-acceptance documentation.

When a waste profile is re-evaluated, PFNW may request the generator do one of the following:

- Verify that the current waste profile is accurate.
- Supply a new waste profile and/or
- Submit a sample for parameter analysis.

In addition, an annual review will be performed on each waste profile to verify the analytical data is accurate, current, and sufficient to properly manage the waste as intended.

GENERAL WASTE MANAGEMENT

Before receiving a waste from a particular off-site source, PFNW shall inform the generator in writing that PFNW has the appropriate permits and licenses and can accept the mixed waste and mixed- TSCA regulated PCB waste the generator is shipping as required by WAC 173-303-290 (3) and Permit Condition II.A.2. PFNW shall keep a copy of this written notice as part of the operating record.

MANAGEMENT OF FOREIGN AND OUT-OF-STATE MIXED WASTE

PFNW shall notify the Director and/or Regional Administrator, as applicable, in writing at least four (4) weeks in advance of the date PFNW expects to receive mixed waste from a foreign source, as required by WAC 173-303-290 (1) and 40 CFR §264.12 (a) respectively. Additionally, PFNW shall notify Ecology in writing at least four (4) weeks in advance of the date scheduled to receive an out-of-state waste in accordance with Permit Number WAR000010355 Permit Condition II.B.2. Notice of subsequent shipments of the same waste, from the same foreign or an out-of-state source, in the same calendar year is not required. Pursuant to 40 CFR §761.93, PFNW shall not import PCBs or PCB items from outside of the customs territory of the United States as defined in 40 CFR §720.3, without an exemption issued under the authority of TSCA Section 6 (e) (3).

PFNW shall notify the Director, in writing, at least four (4) weeks in advance of the date that PFNW expects to receive any mixed waste from an out-of-state generator.

- This notification must include the name and address of the generator, the expected total volume of mixed waste to be received by PFNW, the disposal site and the waste shipment schedule.

- PFNW shall certify in this notification that the generator will be shipping the waste in compliance with the applicable state and federal transportation requirements.

REQUIRED LAND DISPOSAL RESTRICTIONS FORMS

All wastes subject to the Land Disposal Restrictions (LDR) of 40 CFR Part 268 and that meet the appropriate treatment or variance, or that meet the appropriate treatment standard or prohibition without treatment, must be accompanied by a form from the generator certifying that the treated, exempted, or variance waste meets the appropriate treatment standards. This form must include the applicable analytical data or reference to such data or documentation to support the certification in accordance with 40 CFR Part 268.

All wastes subject to LDR and that require treatment must be accompanied by a form from the generator notifying PFNW of the appropriate treatment standards and all applicable prohibitions in accordance with 40 CFR Part 268.

ACTIVITY LIMITS PER SHIPMENT

Volume and mass reduction are to be anticipated for wastes sent to PFNW for processing. Special consideration must be given in pre-shipment analysis to ensure the final processed product is acceptable for disposal.

In accordance with 10 CFR 30, licensees are required to verify the consignee's ability to receive radioactive materials. While all shipments require prior notification and approval, additional approvals may be required to exceed the activity/concentration limits listed in Table 2.0 below.

Table 2.0 Activity / Concentration Limits
• Any container in which the waste activity of atomic numbers 84-103 is greater than or equal to 100mCi requires Washington Department of Health (WDOH) approval prior to receipt.
• Any discrete source greater than or equal to 10 mCi requires WDOH approval prior to receipt.
• 75% of current expected disposal site license limits as received if the waste is to be non-thermally treated.
• 5% of current expected disposal site license limits as received if the waste is to be thermally treated.
• 20% of DOT Type A quantity limits, per container, as received if the waste is to be non-thermally treated.
• 5% of DOT Type A quantity limits, per container, as received if the waste is to be thermally treated.
• Any waste container that exceeds LSA II limits for solids, as received. Solids limits should be applied to liquids for purposes of this requirement. If LSA II limits for liquids are not exceeded, the solids limits will not be exceeded.

SHIPMENT REQUIREMENTS

In order to maintain an up-to-date receiving schedule of shipments to the MWF, the PFNW Transportation Department must be informed of all waste shipments to the PFNW Site regardless of the carrier. The following conditions apply to each waste shipment:

- A one-time approval of each profile, and
- A per-shipment approval notification (Attachment 2)

- All generators shall receive approval from PFNW prior to shipment. In addition, notification from Ecology must be received at least a minimum of four (4) weeks in advance of the shipment arriving at PFNW.
- Drums weighing 2,500 pounds or less must be loaded so that they can be off-loaded using a mechanical lifter.
- Drums may be double-stacked, provided that no drums heavier than 400 pounds are placed on top.

- Drums may be palletized provided that they are secured to the pallet and the gross weight of the pallet does not exceed 4,200 pounds.
- Boxes and liners shall be elevated from the van floor and accessible with a forklift.
- Each package shall have a top clearance of at least 18 inches in a closed van.
- Packages weighing more than 4,200 pounds shall not be shipped in a closed, hardtop trailer.
- Liners, boxes and/or palletized drums shipped on flatbed trailers must be loaded in such a manner that they may be off-loaded from the side using a forklift.
- Items heavier than 12,500 pounds must have at least 6 inches of bottom clearance, or be accessible from the top with approved lifting mechanisms.
- Typically, PFNW accepts radioactive waste/material shipments by highway. PFNW does have the capability to transfer waste onto a tractor/trailer from a nearby rail spur and transport waste to the facility.
- All shipments shall meet all the applicable US DOT and NRC transportation requirements.

MANIFEST REQUIREMENTS

An advance copy of the information below must be provided with each Pre-Shipment Notification Form.

- An EPA or equivalent State Hazardous Waste Manifest must accompany each shipment of mixed waste.
- An NRC Form 540, 541, and 542, as appropriate, must accompany each shipment of mixed waste.
- The following information must be provided for each waste container in the shipment, either on the manifest or on separate cover (typically PFNW would prefer the following information be included in the pre-notification):
  - Container identification number
  - Profile number for each container
  - Hazardous waste codes applicable to each container
  - Physical form (solid or liquid)

- A notation if the container is a "labpack"
- Gross volume of each container (ft^3)
- Net weight of each container (lbs)
- Requested process, by billing category, for each container
- Requested disposal site for each container
- Total chlorine/chloride for each container (mg/kg)
- Total mg/kg concentration for the chemical constituents listed on Attachment 4, Page 3 of 3.

NOTE: If separate containers are packed within an outer container, the above information must be provided for each inner container.

INCOMING SHIPMENT DECISION EVALUATION LOGIC

PFNW will accept or reject each waste shipment utilizing the following major decision points:

Waste Identification: Waste received will be inspected and sampled to verify that it meets the physical and chemical characteristics approved by the waste profile. The effectiveness of the waste identification step is dependent on the information provided during pre-acceptance. Additional factors also may influence the effectiveness of the waste identification process (e.g., waste sampling, analytical results, Land Disposal Restriction (LDR) forms, etc).

Additional Analysis (if necessary): Additional sampling and analysis may be required if the verification results indicate discrepancies with respect to pre-acceptance information, or if PFNW management has reason to suspect that the waste composition has changed.

Waste Non-conformance: A waste shipment will be classified as "non-conforming" if it is different in chemical or physical properties from the information on the waste profile, pre-acceptance information, or manifest. In addition, it is classified as a significant discrepancy if it were "significantly" different in quantity or type than that shown on the manifest as defined by 40 CFR 264.72.

Four (4) major criteria are used to classify "non-conformance". The criteria are:

- For bulk wastes, variations greater than 10 percent in weight.
- For containerized wastes, (e.g., drums, boxes) any variation in piece counts.
- If inspection or parameter analysis of any waste shipment determines differences in waste type or code (e.g., organic waste substituted for acidic waste or toxic constituents not reported on the manifest or shipping paper).
- If the non-conformance changes the originally approved method of management.

Non-conformance Waste Disposition: Non-conforming waste may be rejected or the waste may be re-evaluated for possible acceptance. PFNW' re-evaluation process determines whether a waste in the form identified by PFNW (i.e., not consistent with the waste profile, and/or manifest) can be managed at the MWF and whether or not the generator concurs with the PFNW identification. This process prevents the unnecessary transportation of waste back and forth between the generator and the MWF when the waste can be managed by the facility. By eliminating this unnecessary movement, PFNW is attempting to minimize potential exposure, during transportation, to human health or the environment. Re-evaluation is based on the following criteria:

- Discussions with, or information from, the generator.
- Facility conditions for storage and treatment.
- Additional parameter analyses will be performed as deemed appropriate by facility management.
- Whether the waste can be managed under another profile approved for the generator.
- Permit and license requirements.
- PFNW management judgment.

The waste is accepted if evaluation, based on the above criteria, indicates the waste can be accepted and the generator concurs with the PFNW waste identification. PFNW management will discuss and attempt to resolve with the generator any discrepancies between the received waste and the manifest. If the discrepancy cannot be resolved within 15 days after receiving the waste, PFNW notifies the Ecology in writing of the discrepancy and the attempt to reconcile the discrepancy. PFNW provides Ecology with a copy of the manifest at issue (WAC 173-303-370 and 40 CFR 761.208).

A waste may be rejected during the incoming waste shipment process for any of the following reasons:

- Paperwork provided by the generator or transporter is not in order.
- A manifest discrepancy cannot be resolved to the satisfaction of the generator and PFNW.
- Regulatory requirements (e.g., specific permit conditions).
- A bulk liquid shipment is incompatible (i.e., fails a liquid waste compatibility determination) with wastes stored in the bulk liquid feed tank and no other management method is available.
- Adequate segregated space is not available for containerized liquid wastes and special handling cannot be used to correct the deficiency.

Rejected wastes will be moved and segregated as soon as such a discrepancy is discovered. The rejected waste will be stored in the "container reject" area. PFNW management will have 15 days to complete the resolution process. This will include notifying the generator and attempting to resolve the discrepancy. If it becomes evident that the waste cannot be processed at the MWF, arrangements will be made for returning the waste to the generator or another facility, as authorized by the generator, before the 15-day resolution period expires. If the waste discrepancy is successfully resolved, the waste will be formally accepted and will be moved to the appropriate designated storage areas.

The final decision to reject all or part of a waste shipment is made by PFNW management. Decisions are made as soon as PFNW has collected and considered all of the applicable information listed above. PFNW will strive to complete these decisions as early as practicable, but circumstances may cause delays in obtaining the information necessary to make an informed decision on the acceptability of the waste. Under such circumstances, PFNW will take appropriate action to facilitate the decision process. During this time, proper segregated staging locations are determined using available information (e.g., MSDS, waste profile) to ensure the waste is staged with compatible wastes.

REFERENCED REQUIREMENTS FOR ALL PFNW CUSTOMERS

All customers shipping radioactive waste to PFNW shall comply with the requirements contained in the documents listed in Table 3.0, as applicable:

Table 3.0 Requirements
PFNW Inc., Richland Washington, Department of Health Radioactive Materials License WN-I0508-1
Washington Administrative Codes
U.S. Department of Transportation (DOT) Code of Federal Regulations (CFR) Title 49
U.S. Nuclear Regulatory Commission (NRC) CFR Title 10
U.S. Ecology Low Level Radioactive Waste Disposal License
CNSI Barnwell Waste Management Facility Site Disposal Criteria
Energy Solutions of Utah Site Criteria
Nevada Test Site Acceptance Criteria
DOE – Hanford Waste Acceptance Criteria

PFNW GENERAL FACILITY INFORMATION

Address:
2025 Battelle Boulevard
Richland, WA 99354

Telephone:
(509) 375-5160 (24 hours a day)

FAX:
(509) 375-0613 (24 hours a day)

Emergency:
(509) 375-7066
(24 hours a day)

Normal hours:
Monday through Friday
7:00 a.m. - 4:30 p.m. PST

Observed Company Holidays:

Memorial Day Observance
Independence Day Observance
Labor Day
Thanksgiving and the following Friday
Christmas and the day before or after
New Years Day

Attachment B-3. IFP 37-4 Criteria.

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M&EC Facility Waste Acceptance Criteria

East Tennessee Materials & Energy Corporation (M&EC) operates at Mixed Waste Treatment and Storage Facility in Roane County, Tennessee of the DOE East Tennessee Technology Park. This facility is capable of storing and treating a variety of liquid, solid, and sludge mixed wastes and radioactive only materials using non-incineration based treatment technologies. Hazardous waste storage and treatment operations are authorized by the RCRA Hazardous Waste Management Permit, TNHW-099, issued by the Tennessee Department of Environment and Conservation, Division of Solid Waste Management (TDEC DSWM). Under this permit, M&EC can accept all characteristic and listed EPA Waste Codes.

Radioactive Materials License

The radioactive materials license (TN R-01088-I19), issued by TDEC Division of Radiological Health (DRH) authorizes M&EC to possess for processing purposes radioactive materials (liquids, sludges, and solids). The license limits are tabulated below.

License Parameter	Activity in Curies
H-34	4,000
Atomic Numbers 3 – 83	60
Atomic Numbers 84 – 92	29
SNM*	
U-235	350 grams
U-233	200 grams
Pu	200 grams
TRU	1 (NTE 100 nCi/gram)

* For each kind of Special Nuclear Material (SNM) determine the ration between the quantity of that SNM and the quantity specified in the table above for the same kind of SNM. The sums of such ratios for all kinds of SNM shall not exceed "1" (i.e. unity). This applies to all SNM possessed under the M&EC TRML.

Exceptions are made to the TRML possession limits on a case-by-case basis and must be granted by TDEC DRH. Dose rates expected during storage and processing may be grounds for rejection of certain waste containers and will be evaluated on a case-by-case basis.

Radiation Safety Officer – Joe Hack
Email – jhack@perma-fix.com

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K-1200 South Bay Facility

The M&EC South Bay Facility is a mixed waste processing facility operation under Atomic Energy Act authority. South Bay is managed as a Radiological Facility with a High Hazard Classification under the government of a Safety Analysis Document (M&EC/K-1200/SAD). The quantity of radioactive material at the K-1200 South Bay is maintained so that the sum of the ratios of isotopic inventories with respect to their respective Category 3 threshold quantities (provided in the LANL fact sheet attached in DOE-STD-1027-92) shall not exceed 0.9.

Container specific limits in South Bay are determined base on the container size or dimensions as follows:

Item Volume	Nominal Mass/Concentration
<3.0 liters (0.792 gal)	$\leq$ 5 g ^{235}U FEM/liter
$\geq$ 3 liters and < 5 gal	$\leq$ 15 g ^{235}U FEM
$\geq$ 5 gal and < 10 gal	$\leq$ 20 g ^{235}U FEM
$\geq$ 10 gal and < 30 gal	$\leq$ 30 g ^{235}U FEM
$\geq$ 30 gal and < 55 gal	$\leq$ 60 g ^{235}U FEM
$\geq$ 55 gal and < 110 gal	$\leq$ 150 g ^{235}U FEM
110 gal	$\leq$ 160 g ^{235}U FEM
Boxes B-12 and larger	$\leq$ 350 g ^{235}U FEM

The nominal mass values, based on NDA, analytical samples and/or process knowledge, are assumed to have an associated upper bounding data uncertainty of +50% for mass (i.e., analysis uncertainties of less than or equal to these values do not need to be accounted for when comparing to the FEM/concentration values of the preceding table. However, uncertainty beyond +50% will need to be accounted for in the comparison).

Containers may be overpacked to meet the requirements in the preceding table.

Fissionable Equivalent Mass (FEM) is the total mass of any aggregation of fissionable materials expressed in terms of ^{235}U mass. Below is the table of recognized fissionable isotopes and their respective FEM factors followed by an equation for calculation of FEM.

Nuclide	^{235}U FEM Factor
^{233}U	1.40
^{235}U	1.00
^{236}Np	140
^{237}Np	0.035

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Nuclide	^{235}U FEM Factor
^{238}Pu	0.23
^{239}Pu	1.56
^{240}Pu	0.047
^{241}Pu	3.5
^{242}Pu	0.018
^{241}Am	0.044
^{242m}Am	54
^{243}Am	0.028
^{243}Cm	7.8
^{244}Cm	0.23
^{245}Cm	23
^{247}Cm	0.78
^{249}Cf	70
^{251}Cf	140

^{235}U FEM = (grams of Nuclide 1)*(Nuclide 1 ^{235}U Factor) + (grams of Nuclide 2)*(Nuclide 2 ^{235}U Factor)+ ...

Nuclear Safety Manager – Joe Hack
Email – jhack@perma-fix.com

Attachment B-4. IFP 64.1 Criteria.

Action Levels for LERF/ETF Discharges to SALDS

Constituent	Action Level	Unit
Nitrate (as N)	0	µg/mL
Total Organic Carbon	1	mg/L
Specific Conductivity	10	µS/cm
Gross Alpha	15	pCi/L
Gross Beta	50	pCi/L
Ammonia (as N)	830	µg/L
Arsenic	15	µg/L
Barium	1,600	µg/L
Beryllium	40	µg/L
Cadmium	8	µg/L
Chromium	20	µg/L
Cyanide	480	µg/L
Fluoride	1,200	µg/L
Lead	38	µg/L
Mercury	2	µg/L
Nickel	450	µg/L
Selenium	110	µg/L
Silver	110	µg/L
Vanadium	160	µg/L
Zinc	3,800	µg/L
Acetone	2,400	µg/L
Acetonitrile	1,200	µg/L
Aroclors[1]	0.5	µg/L
Benzene	5	µg/L
1-Butanol	2,400	µg/L
Carbazole	180	µg/L
Carbon disulfide	2,300	µg/L
Carbon tetrachloride	5	µg/L
Chrysene	560	µg/L

Action Levels for LERF/ETF Discharges to SALDS

Constituent	Action Level	Unit
Total methylphenols	1,200	µg/L
Dichloroisopropyl ether	60	µg/L
Diphenolamine	560	µg/L
Di-n-octyl phthalate	480	µg/L
Hexachlorobenzene	2	µg/L
Hexachlorocyclo-pentadiene	180	µg/L
Isophorone	4,200	µg/L
Lindane	3	µg/L
N-Nitrosodimethylamine	20	µg/L
4-Chloraniline	120	µg/L
Pyridine	24	µg/L
Tetrahydrofuran	100	µg/L
Tri-n-butyl phosphate	120	µg/L
2,4,6-Trichlorophenol	360	µg/L

[1]Sum of Aroclor 1016, 1221, 1232, 1242, 1248, 1254, 1260. If all results are "less than" values, record largest.

Reference: ETF-PRO-OP-51535, Chg 3, 2013, "Verification System Operations," Rev. 19, CH2M HILL Plateau Remediation Company, Richland, Washington